COUNTERFEITS, IMITATIONS, AND COPIES OF ROMAN IMPERIAL DENARII

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Counterfeits, Imitations, and Copies of Roman Imperial Denarii

Making and Faking Coins on Both Sides of the Limes

Edited by

ARKADIUSZ DYMOWSKI and KYRYLO MYZGIN

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List of Abbreviations

CRFB 8.1 = Sigrid Dušek, Matthias Becker, Ines Eberhardt, Thomas Grasselt, Alexander Heising, Heike Künzel, Karl Peschel, Mario Schlapke, Mathias Seidel, Monika Aichinger, Karin Fischer, Torsten Kleinschmidt, Frank Klischies, and Anette Pauleweit. 2017. *Südharzvorland, Saale-Elster-Region, Thüringer Wald*, Corpus der römischen Funde im europäischen Barbaricum: Deutschland, 8.1 (Wiesbaden: Reichert)

FMRD x = Rudolf Laser and Karlhorst Stribrny (eds). 2003. *Die Fundmünzen der Römischen Zeit in Deutschland*, Abteilung x: *Sachsen-Anhalt* (Mainz: Mann)

FMRD xiii = Rudolf Laser and Karlhorst Stribrny (eds). 2003. *Die Fundmünzen der Römischen Zeit in Deutschland*, Abteilung xiii: *Thüringen* (Mainz: Mann)

RIC = Richard A. Abdy, Patrick M. Bruun, Theodore Vern Buttrey, Ian Carradice, Robert A. G. Carson, John P. C. Kent, Jerome Mairat, Harold Mattingly, Peter F. Mittag, C. H. Vivian Sutherland, Edward A. Sydenham, and Percy H. Webb. 1923–2023. *The Roman Imperial Coinage*, 10 vols (London: Spink)

RPC = Michel Amandry, M. Blet-Lemarquand, Laurent Bricault, Andrew M. Burnett, Kevin Butcher, Dario Calomino, Ian Carradice, Fabrice Delrieux, Volker Heuchert, Pierre-Olivier Hochard, Anthony Hostein, Chris Howgego, S. Kremydi, E. Levante, Jérôme Mairat, S. Matthies, William E. Metcalf, D. Miebach, Jack Nurpetlian, Ulrike Peter, Pere Pau Ripollés, Marguerite Spoerri Butcher. 1992–2022. *Roman Provincial Coinage*, i–iv and vi–ix (London: British Museum Press; printed and online publications)

RRC = Michael H. Crawford. 1974. *Roman Republican Coinage*, 2 vols (Cambridge: Cambridge University Press)

ThLL vi.1 = *Thesaurus linguae Latinae*, vi.1 (Leipzig: Teubner, 1926)

ARKADIUSZ DYMOWSKI AND KYRYLO MYZGIN

Introduction

Many remains of unofficial workshops manufacturing counterfeit Roman denarii of the first–third centuries AD have been discovered on the territory of former provinces of the Roman Empire. The first such find was recorded in written sources in the sixteenth century. The counterfeiting phenomenon and use of fake Roman denarii in the Roman Empire, especially on the territory of present-day United Kingdom, France, and Germany, has been of interest to archaeologists and numismatists since at least the nineteenth century. This applies both to *denarii subaerati* (plated denarii, fourrées), and *denarii flati* (cast denarii) made of base metal, silver-like alloys. In contrast, outside the Empire the phenomenon of the use of counterfeit denarii, initially only of *denarii subaerati*, was described only in the 1990s for the Central European part of the Barbaricum, although finds of this type of coins had been recorded there much earlier. On the other hand it is only recently that evidence for the manufacture of base metal *denarii flati* was recorded for the first time in Ukraine; finds of base metal *denarii flati* have also been recorded, especially in Ukraine, Poland, and Germany. Presumably, coins of this type had been discovered on the territory of the Barbaricum in the past, but were identified incorrectly as *denarii subaerati* no longer retaining their silver coating, lost to use or corrosion processes, or as silver coins (giving rise to the misconception about the use in the Barbaricum of mostly silver or silver-plated coins). Only the wider-scale use of metallographic studies enabled recognition of coins made of base metal silver-like alloys. At the same time, the most recent research in barbarian imitations of Roman denarii confirmed the production on the territory of today's Ukraine in antiquity of Roman imperial *denarii subaerati*, some of them not affected by barbarization of images and legends. All this research and new discoveries were possible thanks to the titanic work of Ukrainian numismatist Oleg Anokhin, who collected a huge amount of data on coins found in Ukraine and Moldova. Though an amateur, Anokhin's knowledge of Roman coins and their imitations in Eastern Europe is second to none.

These fresh finds from the Barbaricum provided an impetus for a new project launched at the University of Warsaw: *Barbarian Fakers. Manufacturing and Use of Counterfeit Roman Imperial Denarii in East-Central Europe in Antiquity*. To study the phenomena indicated in the project title plans were made to examine coins (and half-products) discovered in hoards, or as stray finds, in Poland, Ukraine, and western Belarus. These were the territories occupied in the later phases of the Roman period by the Przeworsk, Wielbark, and Chernyakhiv archaeological cultures identified with Vandal and Gothic societies.

More than five thousand denarii from Polish, Ukrainian, and Belarusian finds have been screened to pick out possible counterfeit coins. The screening was organoleptic (e.g. it included visual tests, and listening to the sound produced by dropping a coin onto a hard surface), coupled with an innovative method of ultrasonic inspection (using an advanced ultrasonic thickness gauge dedicated to professional industrial tests). More than six hundred finished coins (and half-products) were tested using more detailed, non-destructive examination methods (especially with X-ray fluorescence method — XRF, laser-induced breakdown spectroscopy — LIBS, and particle induced X-ray emission analysis method — PIXE), to confirm whether or not they are fakes, and to obtain data about the composition of their alloy. The general conclusions from this research are the following: as previously stated, in East-Central Europe counterfeits are exceedingly rare in hoards of Roman imperial denarii (the only specimen present in the analysed coin sets was a coin belonging to a hoard from Cichobórz, Poland); we

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confirmed a higher frequency of fakes (*denarii subaerati* and base metal *denarii flati*) found outside hoards (because of the marked diversity of find-spots and archaeological contexts it is beside the point to cite closer statistical data here). The composition of the alloys used in the manufacture of the base metal *denarii flati* in workshops located on the territory of modern Ukraine was determined, with analogous data obtained also for coins from Polish, Belarusian, and Ukrainian finds. The project research results are outlined in more detail in texts contributed to the present monograph by researchers who participated in the project. Not unexpectedly, insights furnished by the project have prompted many new research questions, for instance about the provenance of the coin counterfeiting technology, and closer dating of this production. Furthermore, even now it is clear that the issue of the role of Roman coinage in barbarian societies is more complex than we used to think, and that we can expect future research in Roman coin counterfeiting in the Barbaricum to bring many fascinating discoveries. In contrast to the much more advanced studies of counterfeiting in the Roman Empire, research on analogous phenomena outside the limes have just started.

However, the scope of this present volume is not limited to reporting on the results of the study of fake coins and their half-products discovered in East-Central Europe. The main aim of this publication is to present and analyse available archaeological, historical, and numismatic materials relating to the areas of the European provinces of the Roman Empire and (European) Barbaricum in terms of identifying similarities and differences in the causes and circumstances of the production and use of counterfeit (i.e. made of metals much cheaper than solid silver) Roman imperial denarii in both territories. The hypothetical transfer of ideas, technology, and finished products (i.e. counterfeit coins) should be taken into account. With some minor territorial exceptions, Roman imperial denarii from the first–third centuries AD, including counterfeit coins, are the most common ancient coinage found in Central, Northern, and Eastern Europe beyond the Roman limes. At the same time, forgeries of this category of coins are very common in finds from the Roman provinces too. Therefore, the manufacture and use of counterfeit Roman imperial denarii should be considered as mass-scale phenomena on both sides of the Roman border. Understanding these phenomena is a precondition to providing answers to the question of why and when the Romans and barbarians made counterfeit denarii and how they used them.

Most contributions forming part of the present monograph were based on papers presented by their authors at three international research conferences: the seminar *Problemy arkheologii Tsentral'noy i Vostochnoy Yevropy rimskogo vremeni – nachala epokhi Velikogo pereseleniya narodov (The Problems of Archaeology of Central and Eastern Europe in the Roman Times – Early Great Migration Period)*, held on 26 October 2019 at Medzhybizh in Ukraine; the seminar *Manufacturing and Use of Counterfeit Roman Imperial Denarii on Both Sides of the Limes: Cross-Border Transfer of Ideas, Technologies, Coins, or Independent Phenomena?*, financed by a small grant obtained by Kyrylo Myzgin from the University of Warsaw Centre for Research on Ancient Civilizations, held on 11–12 June 2021 in Warsaw; the session on *Manufacture and Use of Counterfeit Roman Imperial Denarii in Barbaricum*, held on 13 September 2022 during the *XVI International Numismatic Congress* in Warsaw.

Some authors of contributions published here participated in the project *Barbarian Fakers: Manufacturing and Use of Counterfeit Roman Imperial Denarii in East-Central Europe in Antiquity*, others had worked in close co-operation with them (in alphabetical order: Bartosz Awianowicz, Oleksandr Buhay, Arkadiusz Dymowski, Kyrylo Myzgin, Oleksandr Nadvirnyak, Oleh Pohorilets, Vital' Sidarovich), still others are researchers not directly involved in the project but who have studied the phenomenon of counterfeiting of Roman imperial denarii in and outside the Roman Empire (Jarosław Bodzek, Richard Brickstock, Fraser Hunter, Szymon Jellonek, Fabien Pilon, Mario Schlapke, Barbara Zając). The book opens with two papers on counterfeiting in the Roman Empire, followed by articles on findings of counterfeit coins in the central (Germany and Poland) and eastern Barbaricum (Belarus and Ukraine). The last contribution is devoted to the linguistic justification of the term *denarii flati* used in this book to describe cast copies of denarii.

The present volume reports on the results of the research project *Barbarian Fakers. Manufacturing and Use of Counterfeit Roman Imperial Denarii in East-Central Europe in Antiquity*, financed by the National Science Centre, Poland (No. 2018/31/B/HS3/00137), completed 2019–2024 under the direction of Arkadiusz Dymowski at the Faculty of Archaeology of the University of Warsaw. We acknowledge with gratitude the valuable consultation given during the project by Aleksander Bursche, Cristian Găzdac, and Istvan Vida. Last but not least, we wish to acknowledge the cooperation with our partners in Ukraine: State Historical and Cultural Reserve 'Mezhibizh', and Institute of Applied Physics in Sumy. We appreciate the contribution of our colleagues from Ukraine, able to persevere in the face of major challenges, in wartime conditions, after the Russian aggression of 2022.

Translated by Anna Kinecka

RICHARD BRICKSTOCK

1. Counterfeit Coin Moulds from Britannia Inferior

A Summary and Brief Discussion

ABSTRACT This paper aims to provide a brief summary of counterfeit Roman coin moulds discovered within an area roughly corresponding to the territory of the province of Britannia Inferior, extending from Lincoln and Chester in the south to Hadrian's Wall in the north (and thus complementing a further paper in this volume summarizing finds from north of the Wall and from southern Scotland, outside the Roman province). It includes preliminary discussion of several sets of previously unpublished (or incompletely published) finds, from Aldwark in York; from Fulford, near York; and from Doncaster, South Yorkshire; all in advance of fuller publication by the author. In addition, it also rehearses the author's ideas on the dating of the manufacture and circulation of counterfeit denarii as well as on the motives that led to their production, also in advance of fuller publication elsewhere.

KEYWORDS Roman coin moulds, counterfeit Roman coins, Severan denarii

Introduction

Counterfeit Roman coin moulds have fascinated numismatists and antiquarians alike for at least a couple of centuries, and much time and energy have been expended in their study. Considerable progress has been made, particularly in recent decades, in various aspects of the study, most especially in the understanding of the several production processes used in their manufacture (see, especially, Hall 2014, for a modern consideration); but other questions remain open to further discussion. Chief amongst those questions is the problem of who made these moulds; why they made them; and (perhaps most significantly from an archaeological perspective) when they were made; as well as when the resulting counterfeit coins circulated (and ceased to circulate). This paper will make an attempt to address some of these issues after first providing a summary of coin mould finds from an area roughly corresponding to the territory of the province of Britannia Inferior.

The most significant modern interventions in the study of coin moulds in Britannia belong to Carol Sutherland (1937) and George Boon (1988). Both provide both detailed discussion of the subject according to the knowledge available at the time of writing as well as conspectuses of known finds. Maps of both British and continental finds are provided by Hall (2014, 170 and 171). Between them they summarize (and reference) finds from the various known locations:

- Housesteads, on Hadrian's Wall in Northumberland
- Binchester, in Co. Durham
- Millington, in East Yorkshire
- Lingwell Gate, near Wakefield in West Yorkshire
- Lincoln, and several other sites in Lincolnshire (Ancaster; Bottesford; Nocton; and Sleaford)
- Chester

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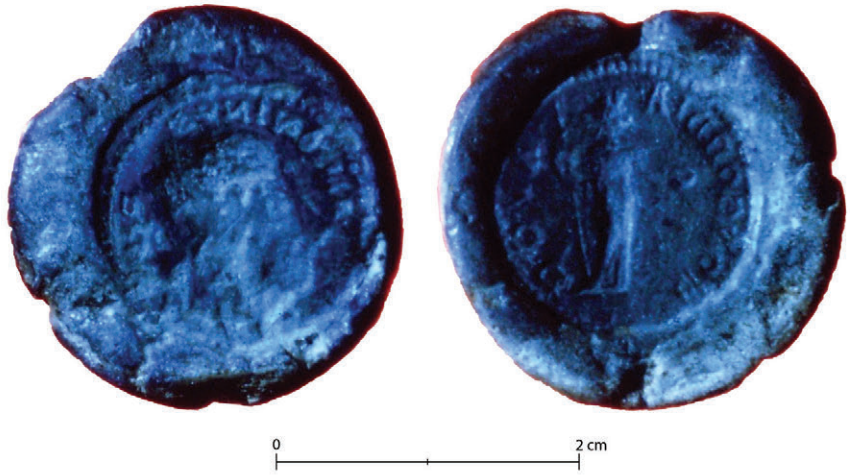

Figure 1.1. Double-sided mould recovered from the Chapel Hill well (image courtesy of Durham University).

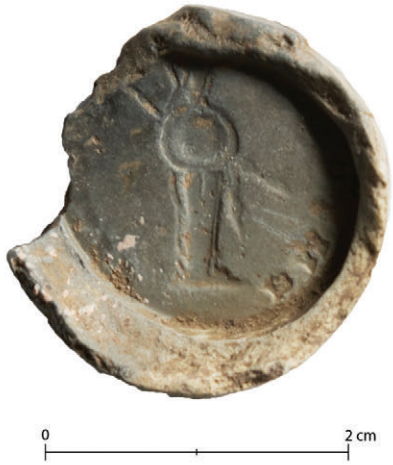

Figure 1.2. Mould recovered at the old Ebor Brewery site on Aldwark in York (image courtesy of the York Archaeological Trust).

Three further assemblages may now be added to this list

- Aldwark, York
- Fulford, near York
- Doncaster, in South Yorkshire

In addition to these, the possibility was recently mooted that an object, recovered from Old Penrith in Cumbria in 1977/1978, was a coin mould; but this proves not to be the case. Having recently re-examined it myself, I can confirm John Casey's original (1980) identification of the object as the remains of a plated counterfeit denarius (see Casey in Austen 1991, 212, find number 856): what was thought might be a coin mould is in fact the interior surface of the layer of 'silver' plating, now separated from the copper core.

There are also several finds from southern Scotland (including Newstead on Dere Street), discussed elsewhere in this volume by Fraser Hunter. Taking the northern English finds in geographical order, working from north to south, we have:

Housesteads

Two moulds from Housesteads on Hadrian's Wall in Northumberland were published by John Casey and the author in the Housesteads excavation report (Brickstock and Casey 2009, 377). One double-sided mould, found in 1932 just south of the fort between *Vicus* buildings III and IV, was intended to counterfeit denarii of Julia Domna (AD 196–211) and Septimius Severus (RIC 499, AD 198+). The other, recovered from the Chapel Hill well, several hundred yards downhill, south of the vallum, showed types of Caracalla and his wife Plautilla (AD 201+; Fig. 1.1). These might be the work of a single counterfeiter; but, given how far apart the two moulds were found, they could equally well represent two entirely separate counterfeiting operations.

Binchester

A single mould from Binchester was noted in the report on the Housesteads excavations of 1932 (Birley and others 1933, 95): the visible letters M AVR can be expanded to either M AVR ANTONINVS CAES or M AVR ANTON CAES PONTIF, both types used for Caracalla as Caesar in AD 196/197.

Millington, East Yorkshire

A mould from Millington in the East Riding of Yorkshire is recorded (Kitson Clark 1935, 110–11), apparently 'resembling those found at Lingwell Gate' (for which see below), but no further detail was provided and the find cannot now be traced.

Aldwark, York

A small number of moulds were discovered in the early 1970s during excavations by the York Archaeological Trust at the old Ebor Brewery site on Aldwark in York, immediately outside the walls of the legionary fortress. Most of these were catalogued by the late John Casey and discussed in brief in the excavation report (Brinklow and others 1986); but an expanded catalogue and full discussion of the eight moulds (four single-sided and four double-sided) is currently in preparation by the author (Brickstock in preparation a). They comprise

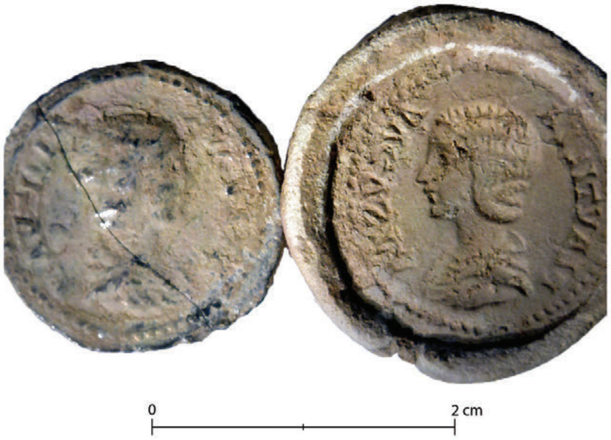

Figure 1.3. Mould and counterfeit denarius of Plautilla found at Fulford (image by the author).

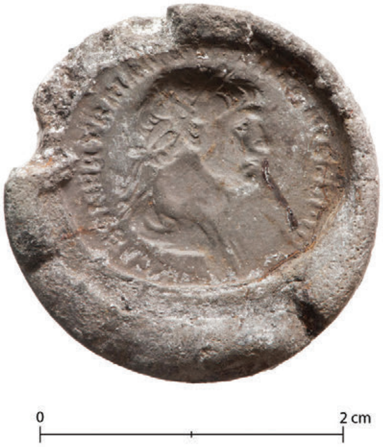

Figure 1.4. Mould from Lingwell Gate (image copyright York Museums Trust (Yorkshire Museum); YORYM: H2402).

nine legible (and three illegible) faces, using five types from four coins of Commodus, Septimius Severus, and Caracalla, dating between AD 184 and AD 198 (Fig. 1.2; reverse of Septimius Severus).

Fulford, Just South of York

An extensive sequence of over one hundred moulds, together with fragments of crucible, was found during excavations by the Malton Archaeological Practice in 2004 at Fulford, a suburb of modern-day York, some three miles south of the Roman fortress and town. These are currently being prepared for publication by the author (Brickstock in preparation b). Just over one hundred impressions have been identified to date, produced from a series of only ten types, the obverse and reverse of five coins, of Marcus Aurelius, Caracalla (2), Plautilla (wife of Caracalla), and Julia Mamaea. The prototypes therefore span the period from AD 163–164 to AD 222–235. Two counterfeit coins were also found, both products of these moulds, one seemingly broken whilst being prised from the mould (Fig. 1.3).

Lingwell Gate, near Wakefield

Several hundred moulds from Lingwell Gate, south of Wakefield in South Yorkshire, by far the most extensive assemblage from the north, have just received a very welcome modern reappraisal (Tilley 2021; available online). These were discovered over a period of 150 years and dispersed amongst at least eight museum collections. To date some three hundred moulds have been traced, and some 160 impressions identified, ranging in date from Trajan (AD 98–117) through to Maximinus (AD 235–238) (Fig. 1.4, obverse of Trajan).

Doncaster

A further extensive sequence of several hundred moulds fragments, representing perhaps fifty moulds, was discovered by Museum of London Archaeology (MOLA) in 2001 at Red House, Doncaster, South Yorkshire. These have been examined by the author and published in the site excavation report (Brickstock 2023). Thus far, only six tentative identifications have been made, all types of Septimius Severus or his wife Julia Domna. A number of plated counterfeits were found in the same context, plus a quantity of metal slag; and what appears to a fragment of the central pipe/cavity down which the counterfeit alloy was poured (Fig. 1.5).

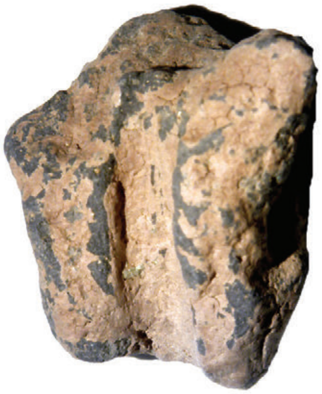

Figure 1.5. Mould fragment discovered at Red House, Doncaster, South Yorkshire (image by the author).

Lincoln and Lincolnshire

Seventeen moulds have been recovered from five sites in Lincolnshire, all noted by both Sutherland and Boon. These are fully listed and discussed in an unnamed blog available online (Lee 2017). They include five moulds from Lincoln; five from Bottesford (the most northerly of these sites); three from Sleaford; two from Ancaster; and two from Nocton. The Lincoln, Bottesford, and Ancaster moulds are for Severan denarii (i.e. Septimius Severus to Severus Alexander) with the exception of a mould of Faustina II from Bottesford. The Sleaford and Nocton moulds are later, counterfeiting Tetrarchic and Constantinian issues.

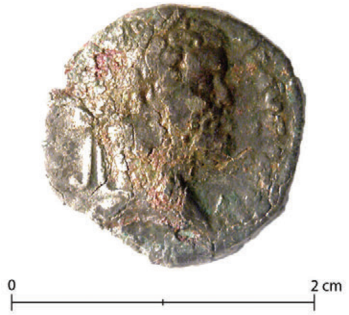

Figure 1.6. Counterfeit denarius of Septimius Severus from Aldwark (image by the author).

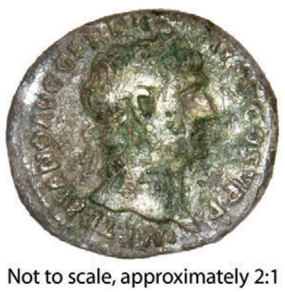

Figure 1.7. Counterfeit denarius of Trajan from Norton (image by the author).

Chester

Sutherland (1937, 43 n. 11) notes a mould (presumably of a denarius) of Hadrian from Chester, examined by him; but no further detail is recorded.

Discussion

The production of cast counterfeits has been extensively studied in recent years and a full and recent discussion of the techniques involved is readily available in the publication of a major series of moulds discovered in London in 1988 (Hall 2014). A brief recapitulation of the process is therefore all that is required here.

Moulds were manufactured by impressing coins into clay to give an image in negative, and small stacks of double-sided moulds were built up, capped at either end by single-sided moulds. A small notch was cut in the side of the stack to allow molten metal to enter the spaces between pairs of moulds to form the coins; and, typically, three stacks were grouped together in a triangle, thus leaving a central cavity or pipe down which the metal could be poured (see Fig. 1.5). A layer of clay was packed round the stacks to provide rigidity during the process of coin manufacture.

The number of moulds in the stack probably varied. Boon (1988, 152) noted the idea that that number could be arrived at by comparing the ratio of single-sided to double-sided moulds, citing continental examples which, by that token, might have contained between nine and thirteen moulds per stack (producing between eight and twelve coins); and Hall estimated perhaps ten double-sided moulds (i.e. twelve in total) for the stacks in the London denarius moulds (Hall 2014, 178). By contrast, the Fulford production centre may have used stacks of only six moulds (four double-sided and two single-sided) to produce five coins from each stack (fifteen from three stacks) (Brickstock in preparation b).

Two distinct types of counterfeit were produced, both using this process. The first produced a copper core which could then be plated with silver (or something sufficiently silvery to pass muster) to produce a counterfeit that would (in antiquity) deceive all but the most observant. Many of these are now betrayed by differential corrosion of the layers and/or abrasion to reveal the copper core (Fig. 1.6). The second used a debased silver alloy to produce a reasonable semblance of silver coinage (see again Fig. 1.3; and Fig. 1.7).

These two processes may merely represent two sides of the same production process — but there is an increasing body of evidence to suggest that in reality these two types of counterfeit were produced for different reasons; and that there may also be significant differences in the date of their production.

It is frequently observed that early to mid-third-century coinage is recovered from sites in only small quantities relative to periods both earlier and later. This is normally blamed on the process of debasement of the silver currency underway at the time (due to an increasing shortage of bullion empire-wide that had its roots in the geographical stagnation of the Empire from the time of Trajan onwards), which resulted in the removal of much of the available currency pool through the hoarding of earlier, more silver-rich issues. However, I have some problem with this widely accepted notion (even though there are certainly numbers of hoards of the period that select types differentially), since the whole notion of coinage in the ancient world, indeed one of the main definitions of coinage, is that the stamp of the issuing authority was its guarantee of value (and bullion content).

Until such time as the general population were no longer able to accept that assurance, life could continue as normal — and the evidence of coin histograms across the province and beyond is that that moment came quite late, namely sometime in the AD 260s, perhaps only part way through the reign of the 'Gallic' emperor Postumus in Britannia (since his early coins are still noticeably silvery), a realization that the silver coinage was no longer anything of the sort, but a copper coinage thinly masked as silver. At that point, the age-old interface between gold, silver, and base metal coinage was shattered and a major monetary crisis ensured (visible in the coin record with the enormous peaks of coinage in the AD 260s and AD 270s and the epidemic of copying in the AD 270s and AD 280s).

The seeming lack of early to mid-third-century coinage on Romano-British sites may not actually represent a shortage of coin at that time. It is apparent from the study of circulation wear visible on the coinage recovered from these sites (using methodology outlined by the author in a paper delivered to the Limes Congress in 2009; Brickstock 2017) that considerable quantities of denarii (together with sestertii, dupondii, and asses) continued in circulation for very long periods, extending well into the third century. A graph of over five hundred denarii recovered from the site of Corbridge in Northumberland can be used to illustrate this point (Fig. 1.8): much of the second- and early third-century silver appears very significantly worn, suggesting that a substantial proportion of it may still have been in circulation in the middle decades of the third century. According to this methodology, the number of denarii in the currency pool in the years AD 222–260 was not dissimilar to the situation that pertained throughout the second century; and the same is true of the AD 260s and the early AD 270s, prior to the defeat of the Tetrici (after which, although it is not apparent from the histogram, the numbers begin to fall off).

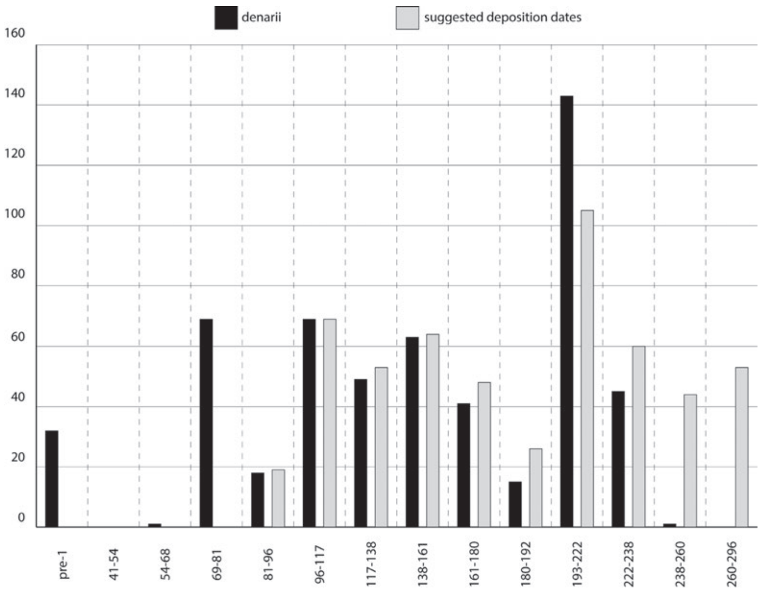

Figure 1.8. A graph of over five hundred denarii recovered from the site of Corbridge in Northumberland (copyright the author).

Confirmation of this picture might perhaps be sought through an in-depth study of the archaeological levels in which denarii are found. Preliminary results of a small-scale study by the author of stratified levels of a number of sites in the north of Britannia (including sites such as Vindolanda on the Stanegate and Catterick on Dere Street) suggest that their period of circulation did indeed extend well into the AD 260s; and that small quantities are found even in late third- and early fourth-century contexts.

Where, then, do counterfeit denarii fit into this picture? A high proportion of the silver coinage of the early third century proves on close examination to be counterfeit, although this fact may not have been evident in antiquity (Brickstock and Casey 2009, 377). Counterfeit coinage, however, formed only a negligible part of the currency pool in the years following the Flavian conquest of the north and throughout the second century up to the accession of Septimius Severus in AD 193. Counterfeit denarii of Titus, Trajan, and others certainly exist (in small numbers) as site finds — but, where a depositional context can be established, virtually all can be assigned to third-century levels. The presence of moulds of second-century emperors such as Trajan and Marcus Aurelius in the Lingwell Gate and Fulford assemblages confirms beyond doubt the third-century status of at least a proportion of second-century counterfeits. Only very rarely do examples of first- or second-century emperors appear to have been deposited in contemporary or near-contemporary contexts (for instance, a counterfeit denarius of Domitian from Vindolanda in a Trajanic/Hadrianic level); and these (so far as I am aware) are exclusively plated counterfeits rather than single-alloy.

The same ongoing analysis of archaeological contexts suggests that, from the time of Septimius Severus onwards, counterfeits circulated in quantity alongside regular denarii and fractional coinage. Modern re-examination of site assemblages and collections (such as that from Aldborough, *civitas* capital of the Brigantes), making use of analytical techniques such as X-ray fluorescence (XRF), suggests that, although as little as 20 per cent of Severan and later denarii were originally identified as counterfeit, the true figure may be closer to 50 per cent (Brickstock 2019, 60). This does not necessarily imply that 50 per cent of the silver coinage in circulation at any one time was counterfeit, since, as has been remarked above, the counterfeit currency was circulating alongside not only contemporary regular silver but also a significant proportion of earlier issues

— but, even so, the quantities of counterfeit coinage appear to have been considerable.

Detailed contextual analysis of the first half of the third century is problematic, but, as is the case with regular denarii, it seems clear that counterfeits appear in all contexts from the AD 190s onwards right the way through to the AD 260s and into the early AD 270s. A few also appear in contexts dominated by radiate copies, i.e. in levels of the later AD 270s and beyond. Where it has been possible to make a distinction, it would appear that the majority of examples from Severan contexts (AD 193–AD 238) are plated counterfeits; while the vast majority of single-alloy counterfeits belong later, in the period after AD 238. It is as well to emphasize, however, that these observations are both preliminary and as yet dependent upon the study of only a relatively small number of sites.

Based on these observations, I would suggest that plated counterfeits, designed to simulate genuine denarii, are likely to have been the produced by criminal counterfeiters intent on personal profit. Relatively small-scale operations, perhaps as witnessed by the Housesteads and Aldwark moulds, probably fit into this category; and these may well date to a period very close to the date of the chosen prototypes (though this cannot yet be proven). A more accurate date for those that used silver plating (rather than something that simulated it), might perhaps be suggested by detailed analysis of the alloys used, since it is unlikely that the counterfeiters would employ a more silver-rich alloy for the plating than appeared in the denarii of the day.

Such counterfeits could, of course, be produced at any period by those with access to the metalworking technology required. The sudden appearance of considerable quantities of counterfeits in the Severan period, after being virtually absent throughout the preceding century or more, therefore requires explanation. It is tempting to try to draw some connection between the counterfeiting phenomenon and the introduction of the 'antoninianus' by Caracalla in AD 215 (a coin that most, but not all, modern commentators believe to have been tariffed at two denarii despite containing only 50 per cent more metal) — but, although there may well have been resistance to the new denomination, it is not at all obvious why this should have prompted counterfeiters to leap into action. Perhaps there was indeed an increased demand for the trusted denomination, a demand which counterfeiters hastened to supply — but I remain open to more convincing explanations.

Singe-alloy counterfeits, by contrast, might well be an officially sanctioned response to a genuine shortage of silver coin, an attempt to preserve the Augustan system of gold, silver, and bronze/copper coinage (and the denarius, the silver coin, rather than the antoninianus, the much more debased coin, would be the obvious denomination of choice). Large-scale operations, such as Lingwell Gate and Fulford, appear to belong in this category: these had the potential to inject large numbers of coins into an ailing economy (though hardly, it must be admitted, in such numbers that they would alleviate a shortage of silver currency province-wide).

George Boon, on the basis of mould finds, assigned the majority of the counterfeiting phenomenon (without distinguishing between plated and single-alloy) to the years following AD 238; and his observation of 'antoniniani' of Trajan Decius overstruck on denarii appeared to imply an end date of AD 249. The London moulds, however, forced him to acknowledge the likelihood that production continued into the AD 250s (Boon 1988, 125–26). It can still safely be said that most, if not all, of this phase of counterfeit coin production belongs to the period after AD 238; while the London moulds do indeed make it fairly clear that it extended into (even if it did not begin in) the AD 250s. On the basis of the evidence summarized above, however, I would go further, and suggest that the majority of single-alloy counterfeits belong to the AD 250s and AD 260s, the period of most extreme shortage of silver coin, in the years immediately prior to the final collapse of the Augustan system in the early AD 270s.

The silver coinage of the AD 240s and early AD 250s (the reigns of Gordian III, Philip, Decius, and even Gallus and Volusian), although much debased, appears to have been of sufficient standard to maintain its place in the tripartite currency system; while the continued production of aes denominations through the AD 240s and into the AD 250s (including the early years of Valerian), albeit on a reduced scale, demonstrates that the Augustan system was still operative. Under Valerian and Gallienus, however, that situation changed: the 'antoninianus' was finally debased beyond a point where it could be passed off as a silver currency, and, with that, a sudden disconnect appeared in the monetary system. With no recognizably silver coinage in production, the silver element was supplied solely from the existing stock of denarii and earlier, more silver-rich, 'antoniniani'. In this context, I would suggest that the production of counterfeit denarii is readily understandable as a locally sanctioned response to an obvious currency shortage, an ultimately vain attempt by local authorities to maintain the integrity of the Augustan system of gold, silver, and bronze.

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FABIEN PILON

2. The Production of Struck and Cast Denarii in Châteaubleau (France) during the Second Half of the Third Century AD

ABSTRACT The Châteaubleau mint (Seine-et-Marne, France), with its three officinae located and partially excavated between 1995 and 2021, is a major illustration of the production of imitations of antoniniani, denarii, and double sestertii in the north-western provinces during the second half of the third century, using both striking and casting. With regard to denarii more specifically, the discoveries made in officina 1, located in the north-western district of the ancient town, illustrate these two methods and the characteristics of the denarii produced: objects used during the striking process, moulds and prototype coins for the casting process, monetary alloys, and the dating of issues.

KEYWORDS Châteaubleau; denarii; striking; casting; third century AD

The issuing of coins on the margins of official mints is an ancestral practice that appeared as early as the first coins issued around 600 BC (Le Rider 2001, 59–67). Herodotus tells us, for example, that Polycrates, tyrant of Samos between *c.* 538 and 522 BC, is said to have corrupted the Lacedemonians with golden lead coins (Herodotus, III. 56). And such coins have indeed been found (Boon 1988, 102). In Roman times, all denominations produced under the control of the emperor or by an authority recognized by him — senate, provinces, cities — were affected, whether they were made of gold, silver, or copper alloy. Depending on the case, the motive was political, economic, or simply criminal. The practice was especially widespread in the Roman West, with sometimes very high percentages of imitations in site coins and hoards (Fig. 2.1). The periods most affected were the mid-first century AD, the last quarter of the third century, the years 318–330 ('Constantinian imitations'), the mid-fourth century ('post-Constantinian imitations'), and the end of the fourth century ('Theodosian imitations') (Boon 1988, 113–45). Outside of these paroxysmal periods, the rates of coins issued on the margins of imperial structures remained significantly below 1 per cent. This is quite similar to what we observe today for the Euro, but with one major difference: the threshold of economic acceptability of the state, which today is little more than one in a few thousand, whereas it could reach several tens of per cent in the Late Empire.

Percussion and casting were used for imitation coinage, with a wide variety of operating methods that were sometimes comparable to those of official coinage. The corpus we have compiled during our PhD thesis includes fifty local workshops that struck imitations (Pilon 2016). Of these, thirty-seven concern the second half of the third century (Fig. 2.2), two the late second–early third centuries, seven the mid-fourth century, and four remain of uncertain dating. This result is notable in the light of the previous works. Nevertheless, it only half-opens the veil on these monetary practices, because the number of mints is necessarily several orders of magnitude higher, as the

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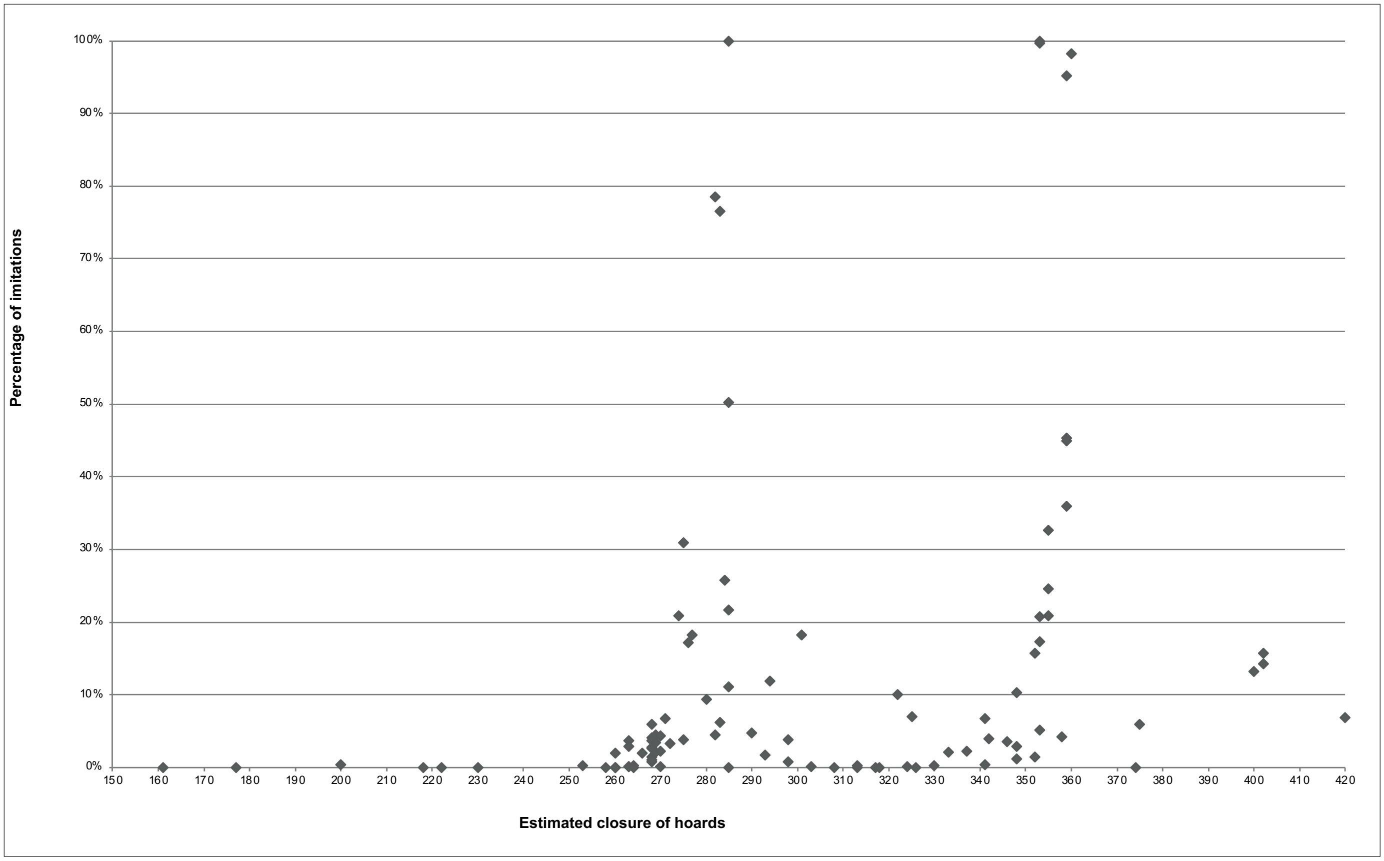


Figure 2.1. Impact of imitations in one hundred hoards buried in the north-western provinces from the mid-second century AD to the early fifth century (cf. Pilon 2016, 9).

millions of imitations produced imply. Unlike the workshops that struck coins in the third century, those that cast imitations have already been the subject of a remarkable synthesis publication (Lallemand 1994), a work recently updated (Aubin 2003) and completed by some unpublished discoveries (Pilon 2016, 179–80). Thus, ninety European towns have yielded one or more sets of third-century terracotta moulds. This is three times higher than the number of cities that have provided evidence of striking. However, it does not imply that casting was more widespread, as moulds are easier to spot than small coins. Moreover, moulds were generally not recycled after use, whereas monetary artefacts — blanks, cylinders, rods — could always be recast. Above all, it can be seen that the map of mould finds is different from the one of the workshops that practised percussion (Fig. 2.3), with some occurrences in Gallia Narbonensis, Aquitania, Rhetia, Noricum, and in the Italian provinces. The reason for this is essentially chronological, as most of the workshops that cast third-century coinage did so well before the end of the 250s. Thus, only fourteen finds used prototype coins post-advent of Postumus in AD 260 and before the Tetrarchy: Bordeaux, Châteaubleau, Château-Porcien, Corseul, Damery, Kenn, Keynsham, Lyon, Luxeuil, Newstead, Reims, Rezé, Saarlouis, Whitchurch. All of them are located on the territory of the Gallic Empire where the last good antoniniani were issued in Trier by Postumus.

History of Discoveries in Châteaubleau

Monetary activity has been documented for a very long time in Châteaubleau (Seine-et-Marne, France) since the first discovery in relation to it was made. It consists of a number of clay moulds mentioned by a schoolteacher, Victor Burin, in a letter dated 23 July 1858 (Burin 1858). A second letter, addressed on 19 October 1863, reports: 'we found granite millstones, deer antlers, boar's teeth, bones of large animals, and a fairly large number of coin moulds […] in a well 3 metres in diameter […] which had not been emptied thoroughly' (Burin 1863). In September 1865, Victor Burin excavates another well, where more than two hundred whole specimens and a considerable quantity of fragments were unearthed, some still containing the coins that had been cast in them (Burin 1865).

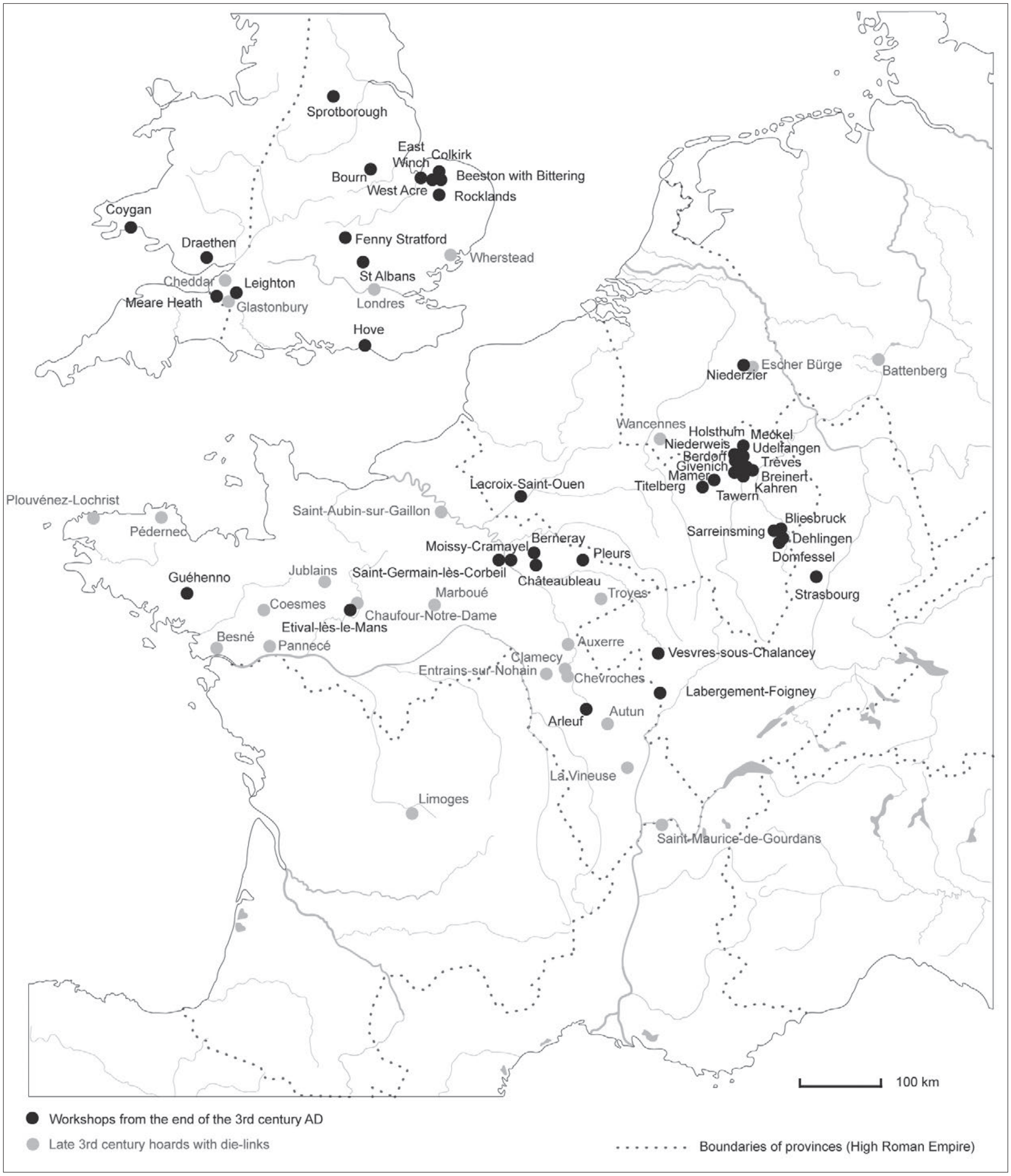

Sprotborough
East Winch
Colkirk
Bourn
Beeston with Bittering
West Acre
Rocklands
Coygan
Draethen
Fenny Stratford
Wherstead
St Albans
Cheddar
Leighton
Meare Heath
Glastonbury
Londres
Hove
Niederzier
Escher Bürge
Battenberg
Wancennes
Holsthum
Meckel
Niederweis
Udelfangen
Berdorf
Givenich
Trèves
Mamer
Breinert
Titelberg
Kahren
Tawern
Lacroix-Saint-Ouen
Plouvénez-Lochrist
Saint-Aubin-sur-Gaillon
Pédernec
Bliesbruck
Sarreinsming
Dehlingen
Berneray
Moissy-Cramayel
Pleurs
Domfessel
Guéhenno
Jublains
Saint-Germain-lès-Corbeil
Châteaubleau
Strasbourg
Marboué
Troyes
Coesmes
Chaufour-Notre-Dame
Etival-lès-le-Mans
Besné
Pannecé
Auxerre
Vesvres-sous-Chalancey
Clamecy
Entrains-sur-Nohain
Chevroches
Labergement-Foigney
Autun
Arleuf
La Vineuse
Limoges
Saint-Maurice-de-Gourdans
100 km
● Workshops from the end of the 3rd century AD
● Late 3rd century hoards with die-links
Boundaries of provinces (High Roman Empire)

Figure 2.2. Map showing the location of workshops that struck imitations of antoniniani in the second half of the third century AD, as well as hoards with numerous die-links (CAD: M. Pilon).

It was not until 120 years later that the diversity and importance of the monetary activity became apparent. A deposit containing several hundred mostly fragmented blanks was discovered in October 1985 in the northern sanctuary (Pilon 1998, 79–85). Ten years later, a campaign of surface surveys led to the location of three officinae: officina 1 and 2 in the town of Châteaubleau itself, and officina 3 in its immediate vicinity. These promising finds led to several excavation campaigns at their very location and in their immediate vicinity. These operations, carried out between 1997 and 2021, revealed a large number of coins and manufacturing intermediates (rods, cylinders, blanks, moulds) characteristic of minting activity.

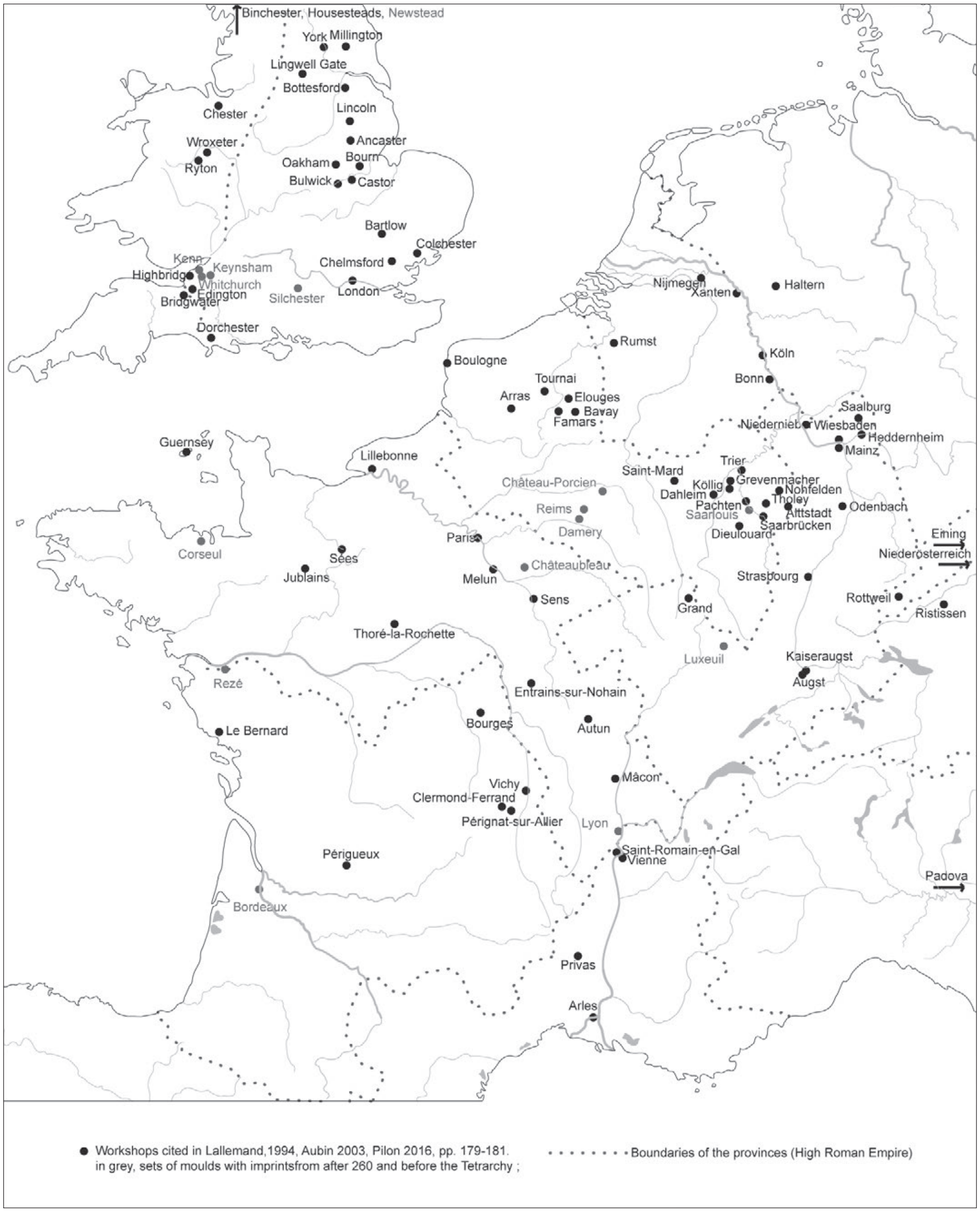

Binchester, Housesteads, Newstead
York
Millington
Lingwell Gate
Bottesford
Chester
Lincoln
Wroxeter
Ancaster
Ryton
Oakham
Bourn
Bulwick
Castor
Bartlow
Colchester
Kenn
Keynsham
Chelmsford
Highbridge
Whitchurch
Edington
Bridgwater
Silchester
London
Dorchester
Nijmegen
Xanten
Haltern
Rumst
Köln
Boulogne
Bonn
Tournai
Arras
Elouges
Bavay
Famars
Saalburg
Niederbieber
Wiesbaden
Heddernheim
Guernsey
Mainz
Lillebonne
Trier
Saint-Mard
Köllig
Grevenmacher
Château-Porcien
Dahleim
Nohfelden
Pachten
Tholey
Reims
Saarlouis
Alttstadt
Odenbach
Damery
Dieulouard
Saarbrücken
Corseul
Paris
Eining
Sées
Niederösterreich
Châteaubleau
Jublains
Melun
Strasbourg
Sens
Rottweil
Grand
Ristissen
Thoré-la-Rochette
Luxeuil
Kaiseraugst
Augst
Rezé
Entrains-sur-Nohain
Bourges
Autun
Le Bernard
Mâcon
Vichy
Clermont-Ferrand
Pérignat-sur-Allier
Lyon
Saint-Romain-en-Gal
Vienne
Périgueux
Padova
Bordeaux
Privas
Arles
● Workshops cited in Lallemand,1994, Aubin 2003, Pilon 2016, pp. 179-181.
in grey, sets of moulds with imprintsfrom after 260 and before the Tetrarchy ;
• • • • • • • Boundaries of the provinces (High Roman Empire)

Figure 2.3. Map showing the location of the finds of third-century terracotta money moulds (CAD: M. Pilon).

The officina 1 of Châteaubleau

The north-western quarter was established between the Roman road (a branch of the *via Agrippa*) and the covered gallery that linked the central cult complex to the northern sanctuary. The development of this sector began at the end of the first century AD with the digging of a vast network of pits that may have been linked to the working of animal skins. After the pits were filled in during the second half of the second century, a few dozen buildings were constructed and linked by a network of paved streets. Several craft activities were established there: primary butchery practices associated with large, even exceptional, oxen; the practice of collagen recovery evidenced by scattered crushed bone; leather manufacturing; iron and bronze work, as well as the manufacture of imitation coins. Indeed, 3864 objects associated with this activity were found in the north-western quarter. Most of this material came from a limited number of hollow structures (wells, latrines, excavations of various kinds), deposited as primary dumping or scattered in occupation levels (Fig. 2.4). Although it is not possible to identify the buildings that

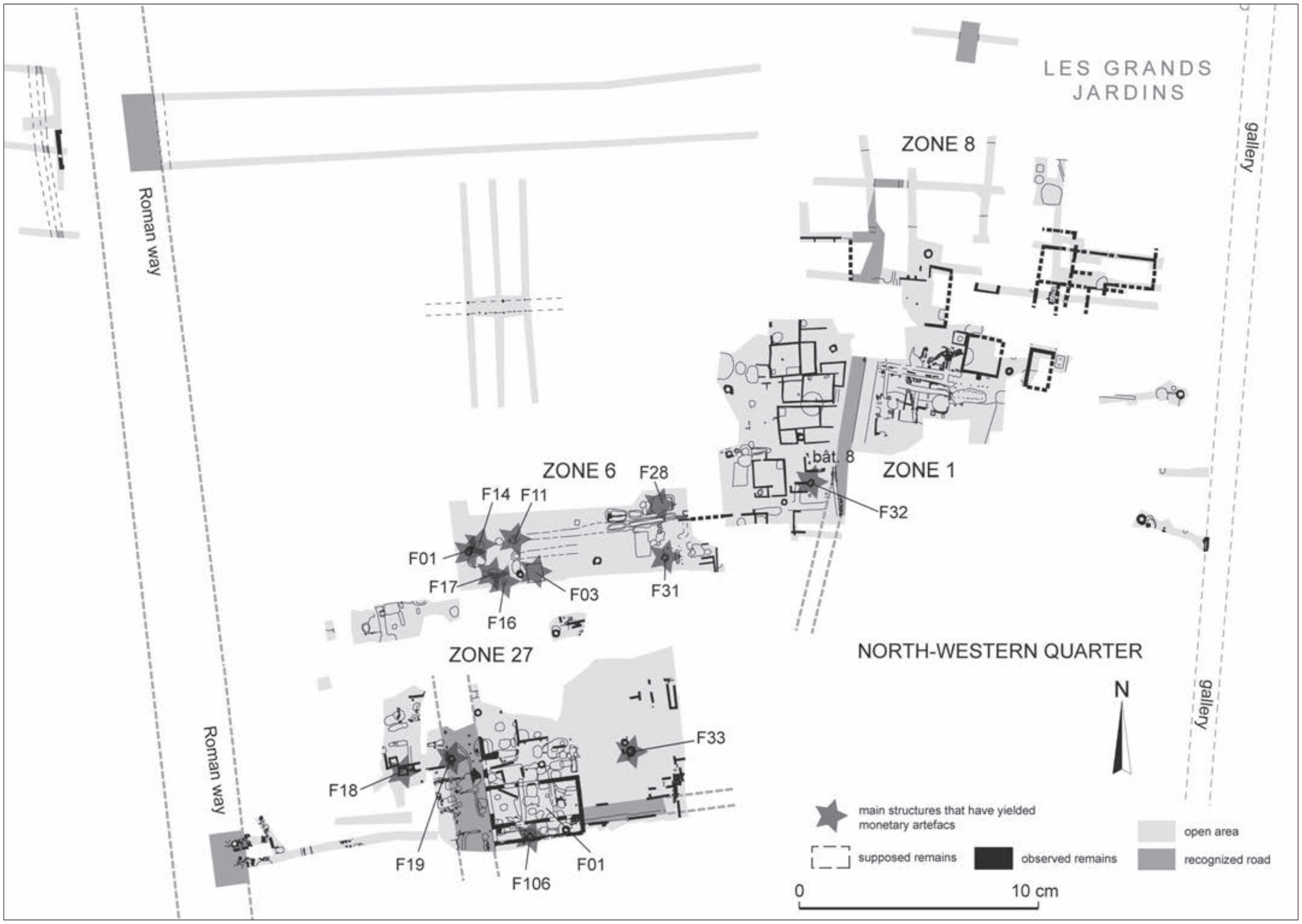

LES GRANDS JARDINS
ZONE 8
gallery
Roman way
ZONE 6
F28
F14
F11
F01
F17
F03
F16
F31
bât. 8
ZONE 1
F32
ZONE 27
NORTH-WESTERN QUARTER
N
gallery
Roman way
F33
F18
F19
F106
F01
main structures that have yielded monetary artefacs
supposed remains
observed remains
open area
recognized road
0
10 cm

Figure 2.4. Hollow structures that yielded the largest quantities of artefacts from officina 1 (survey: La Riobé; CAD: S. Eusèbe, Inrap).

housed the striking and casting activities, the location of the finds at least allows us to delimit the workshop between the Roman road and the excavation named zone 1. It also suggests that the largest building (F01/Z27), 19 m long and 12.5 m wide, belongs to the officina.

Coin Minted in Officina 1

Struck Productions

More than 340 objects testify to the striking of antoniniani, denarii, and double sestertii at the Châteaubleau officinae. Antoniniani (mainly) and denarii are characterized by the discovery of silvered coins, rods, cylinders, and generally silvered blanks. At least two classes of antoniniani can be distinguished: heavy specimens (over 2 g), mainly plated; light ones, less than 2 g and without silvering. A denarius lead proof was collected only a few metres from another one of an antoninianus from Postumus. This 4.52 g piece was struck with a matrix bearing a laurelled, cuirassed, and draped bust of Maximinus I, facing right and viewed from the rear (Fig. 2.5); the effigy is accompanied by the legend IMP MAXIMINVS PIVS AVG (Gricourt and others 2003, 21–23, 32, pl. 1). The prototype which inspired the engraver — an aureus or more likely a denarius — was issued in Rome between March 235 and January 236 (see RIC IV.2, 1–3; 7A; 9–17). The opposite side of the proof has no reverse. But a fragment of legend]S P[indicates an earlier attempt overwritten by this one. A similar uniface object, reproducing a denarius obverse of Septimius Severus was discovered in England, at Washingborough (Lewis 2006, 56).

The discovery of this proof attests to the minting of denarii at the officina 1. However, its uniqueness makes it impossible to specify its metrological, iconographic, and technical characteristics. At most, it is assumed that, like the antoniniani of officina 1, these coins may have been silvered and their blanks prepared from rods in order to make them comparable to official specimens. Two silver blanks, whose modulus could correspond

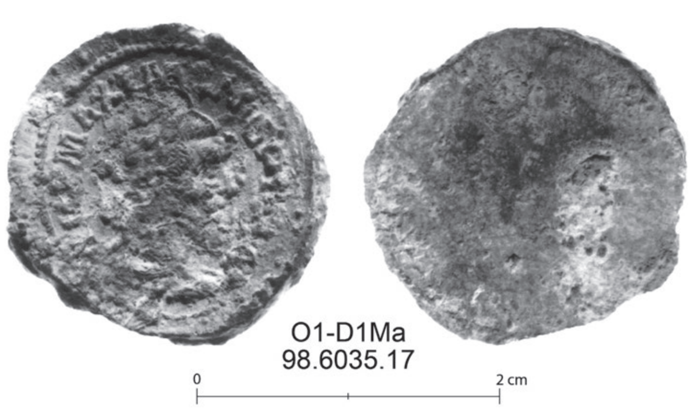


Figure 2.5. Test of a denarius obverse die of Maximinus I (photos: D. Biasi).

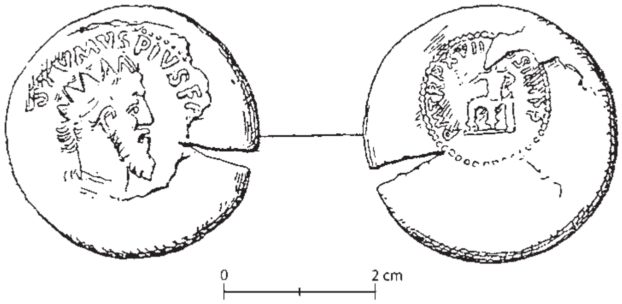


Figure 2.6. Double sestertius struck with an obverse die of Postumus and with a reverse die of a denarius of Caracalla (after Lalanne 1900).

to denarii rather than antoniniani (1.74 g/16.2 mm and 1.39 g/14.4 mm, respectively), have been found. It should also be noted that a plated denarius bearing the effigy of Trajan, discovered in a pit in the same area, could have been issued in officina 1. However, the absence of a die proof or a manufacturing failure using the same dies does not allow us to confirm this.

The impression of the Maximinus die proof only provides a *terminus post quem*. Although the official production and circulation of the denarius became episodic at the end of the reign of Gordian III in 244, hoarders had long sought out copies that were deemed to be of good quality. The mixed antoniniani/denarii deposits, such as that of Cravent (Yvelines, France), bear witness to this for the reign of Postumus (Foucray and Hollard 1995). Several numismatic remains even show that denarii were still being copied by striking as well as by casting in the 260s and 270s. A bronze coin bearing a double sestertius obverse with the effigy of Postumus and a denarius reverse (Fig. 2.6), issued by Caracalla in 214, is a remarkable proof of this (Lalanne 1900). The same is true for terracotta moulds bearing on one side the imprint of a denarius and on the other side an imprint of a coin from Aurelian (Aubin 1990; Holmes and Hunter 2001). But such hybrids are rare and not representative of the multitude of mould finds. The proposed dating of the issue of denarii struck at officina 1 therefore remains highly imprecise, with a consecutively wide chronological range (*c.* 240–275).

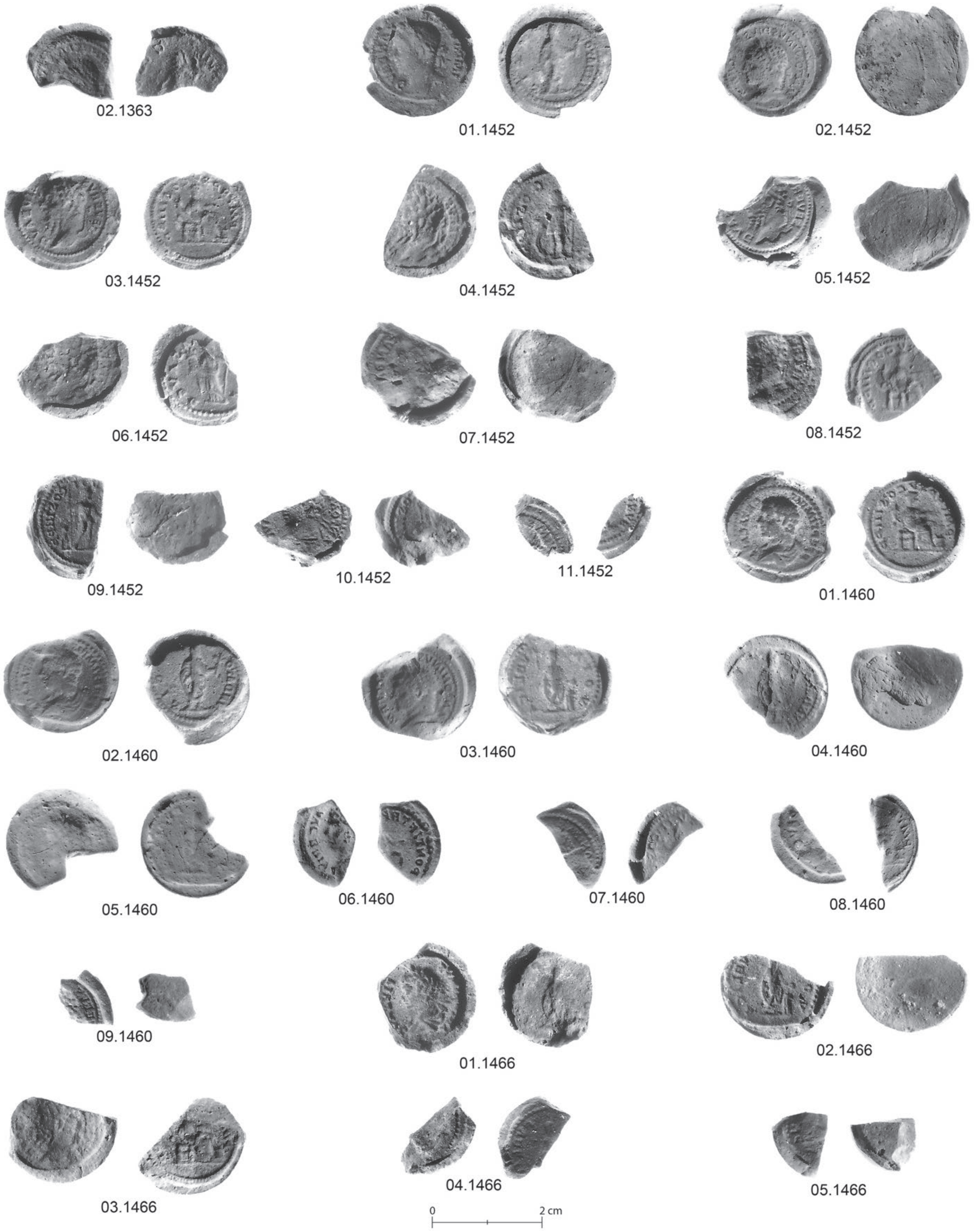
Cast Productions

The discoveries made at the officina 1 of Châteaubleau are among the most important ones. In total, 3485 more or less complete clay moulds as well as thirty-eight identifiable failed coins prove the existence of a production of cast denarii, antoniniani, and double sestertii and make it possible to define their characteristics. The denarii were stamped with the effigies of Septimius Severus, Caracalla, Geta, Elagabalus, Julia Paula, Severus Alexander, Julia Mamaea, Maximinus I, Gordian I, and the antoniniani with those of Julia Domna, Macrinus, Caracalla, Elagabalus, Balbinus, Gordian III, Philip I, Otacilia, Herennia Etruscilla, Volusian, Gallienus, Valerian II, Saloninus, Postumus, and even Tetricus II if the written documents of the time are to be believed. Concerning double sestertii, officina 1 is only the second mint recorded, the first one being at Château-Porcien (Ardennes) where two fragments of moulds were collected during the excavation of a temple (Bastien 1975).

Prototype Coins

The study of moulds requires the identification of each imprint from positives made with modelling clay, and then the recognition of the links between moulds and therefore between the coins that served as models. The matching of the obverse and reverse sides of these prototypes is then sought from the failed coins or from characteristic irregularities (a notch on the edge for example). Finally, all this information is compared to allow for a detailed analysis, and to help identify possible re-gluing and reassembly of stacks. The creation of imprint linkage diagrams also made it possible to distinguish four lots of prototype coins.

Lot 1 has been identified from twenty-six moulds (Fig. 2.7), all linked to one another, and one casting failure. As far as is known it consists exclusively of denarii, at least nine, all of low wear and struck in a very short period (209–222), which indicates a careful selection. Other striking features of the set are the absence of antoniniani imprints — including those struck under Caracalla and Elagabalus between 214 and 222 — and the absence of scattering, since the moulds come exclusively from the filling of well F32/Z01 and its periphery, unlike the other lots. The off-positioning of this structure could be the result of a practice independent of officina 1 or chronologically separated from it.



02.1363
01.1452
02.1452
03.1452
04.1452
05.1452
06.1452
07.1452
08.1452
09.1452
10.1452
11.1452
01.1460
02.1460
03.1460
04.1460
05.1460
06.1460
07.1460
08.1460
09.1460
01.1466
02.1466
03.1466
04.1466
05.1466

Figure 2.7. Moulds imprinted by the prototype coins of lot 1 (photos: D. Biasi).

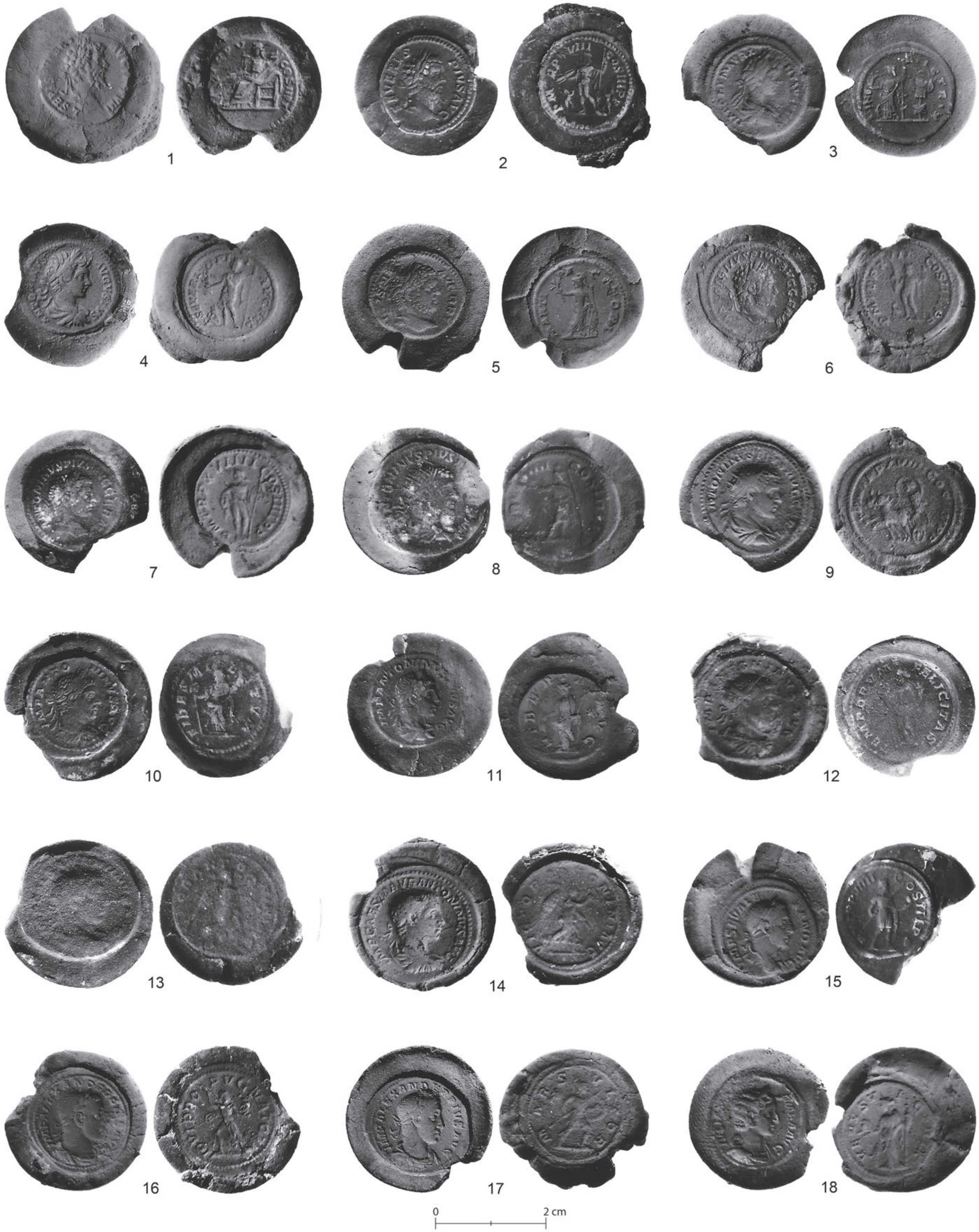

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
0
2 cm

Figure 2.8. The twenty-two prototype coins of lot 2 illustrated by mirror images of moulds (photos: D. Biasi).

Lot 2 is the best illustrated of all, with 2890 moulds — all related to each other — and with twenty-one casting failures. Unlike the previous one, the set mixes at least fifteen denarii, including a rare Gordian I struck in March–April 238, and seven antoniniani (Fig. 2.8), including one struck in 248 in the name of Philip I which is the *terminus post quem* of the lot. These prototypes were used with very different frequencies: sixteen represented by more than eighty obverse and reverse imprints, one by about forty, and the other five by less than twenty. This result reflects the preferential use of some of them or an evolution in the composition of lot 2. This lot also differs from the previous one by the longer period covered by prototypes (196–248), and by the dispersion of moulds in three structures (F01 and F14/Z06, F19/Z27). The most important collection is the one uncovered in well F19/Z27, which mixes matrices imprinted by lot 2 (mostly) and lot 3, with 876 fragments of terracotta having bound the stacks (Fig. 2.9). The reattachment of two fragments proves that the piles of moulds were grouped into threes, with a common central casting channel in the centre of the triangle thus formed. Several were partially or completely reconstructed, which shows that the discovery of well F19/Z27 forms an important part of a primary discharge from the officina (Fig. 2.10).

Lot 3 is known by forty-eight more or less fragmentary double sestertii moulds and by eight casting failures, all with an effigy of Postumus (Fig. 2.11). Their imperfections are the result of problems during casting (sometimes significant metal shortages), mould defects, or even incorrect repositioning after removal of prototypes, which causes notable shifts between the two halves of the coin as well as irregular thickness. This lot must have been only made up of double sestertii because of the differences in diameter and alloy with those of denarii and antoniniani. This production, whose witnesses come from a large zone (F01, F14 and F16/Z6, F19/Z27), used official prototypes and even imitations (copies of copies in a way!). Twelve reverses were individualized, but only seven could be associated with an obverse.

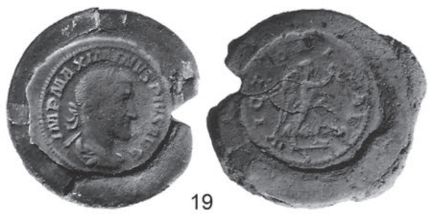
Lot 4 is the most important one, with a minimum of sixty-five antoniniani, of which nearly 30 per cent were Postumus ones. At least 328 moulds are associated with it, as well as ten casting failures. The chronological range covered by the prototypes is the widest (214–266), with only two coins minted between AD 214 and 222, compared to sixty-three minted after the resumption of antoniniani minting in AD 238 and before the devaluation of mid-268. At least twenty-three were issued by Gordian III and nineteen by Postumus, many of them struck during issue 3b of his main mint (i.e. between late 262 and 266) and mostly in the MONETA AVG type. Two uncertainties remain about the composition of lot 4 (Roman 1866a; 1866b). The first is the report of a mould with an effigy of Julia Mamaea in 1865 that could only be a denarius belonging either to this lot or, more logically, to lot 2. The second concerns the presence of an effigy of Tetricus II. Doubt therefore remains as to the *terminus post quem*, which could be the reign of Tetricus or that of Postumus if one refers to the only moulds preserved. We can still observe a very wide dispersion of the moulds issued from lot 4, since they were found in excavation zones 1, 6, and 27, and sometimes in large numbers, such as in pit F14/Z06 and in two wells: F33/Z27 and the one emptied in 1865. The location of this ancient discovery in the area of officina 1 is thus confirmed, thanks to the new specimens uncovered and the multiple links with the moulds of 1858/1865.

Piles

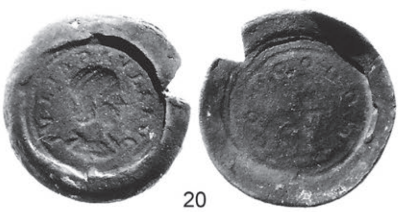
For each lot of prototype coins, the number of coins cast in a pile can be estimated from a few units for lot 1 to about fifteen for lots 2 and 3; for lot 4 (antoniniani), it reaches the value of forty-three which has never been observed elsewhere. It seems nevertheless plausible, given the high numbers of moulds (328) and prototypes (at least sixty-five), and its ratio of obverse to reverse imprints (1:1). Furthermore, the height of such a stack, estimated at 22 cm taking an average mould thickness of 5 mm, is not unrealistic. These figures are orders of magnitude, because the calculations count as '1' any mould fragment, whatever its state of preservation, and disregard any possible re-gluing. In the case of the moulds from lot 2 discovered in well F19/Z27, the fragmentation rate was evaluated for each element and a fraction between 0 and 1 was assigned. This results in an equivalent of 1609 complete moulds and an estimate of fourteen coins per pile, a number not very different from the one calculated according to the general method (seventeen) and consistent with the reconstructed piles, which contain from seven to at least twelve moulds.

Chemical Composition

Some cast coins have been characterized by FNAA (Fast Neutron Activation Analysis) and ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry). The metal used for the denarii and antoniniani is identical. It is a bronze with a high stannic content (23 to 27 per cent) and about 4 per cent lead. Its purpose was to provide a metallic grey appearance similar to that of the imitated silver prototypes. The aim was to produce coins that were identical to the official ones, since they had the same imprints and a silver appearance, despite the absence of precious



19



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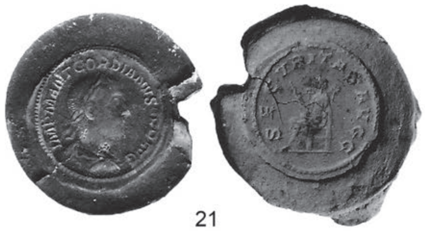

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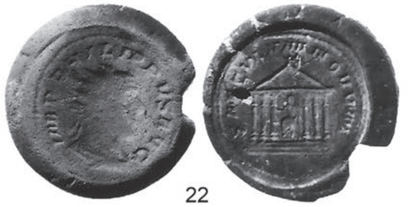

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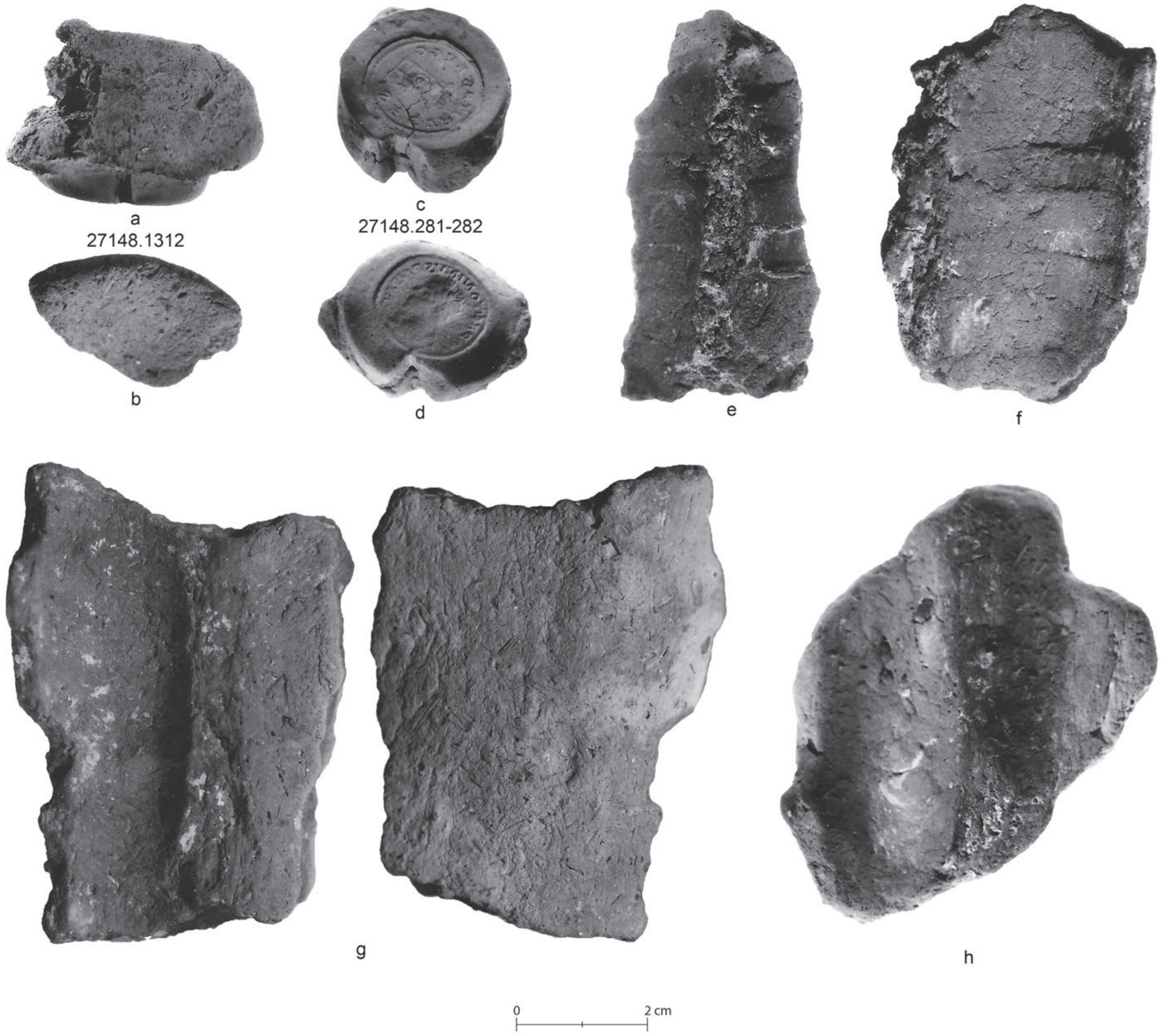
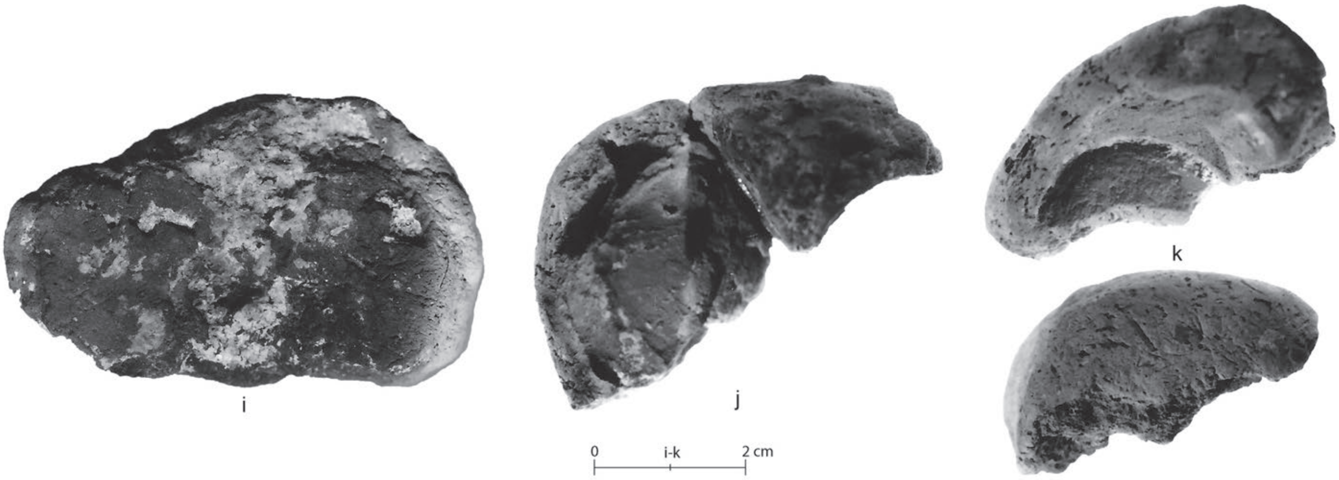

a
27148.1312
c
27148.281-282
b
d
e
f
g
h
0
2 cm

Figure 2.9. Fragments of piles associated with lot 2: funnels (a–b); moulds with coin inside (c–d); pieces of envelope (e–h) and bottom (i–k) (photos: D. Biasi).



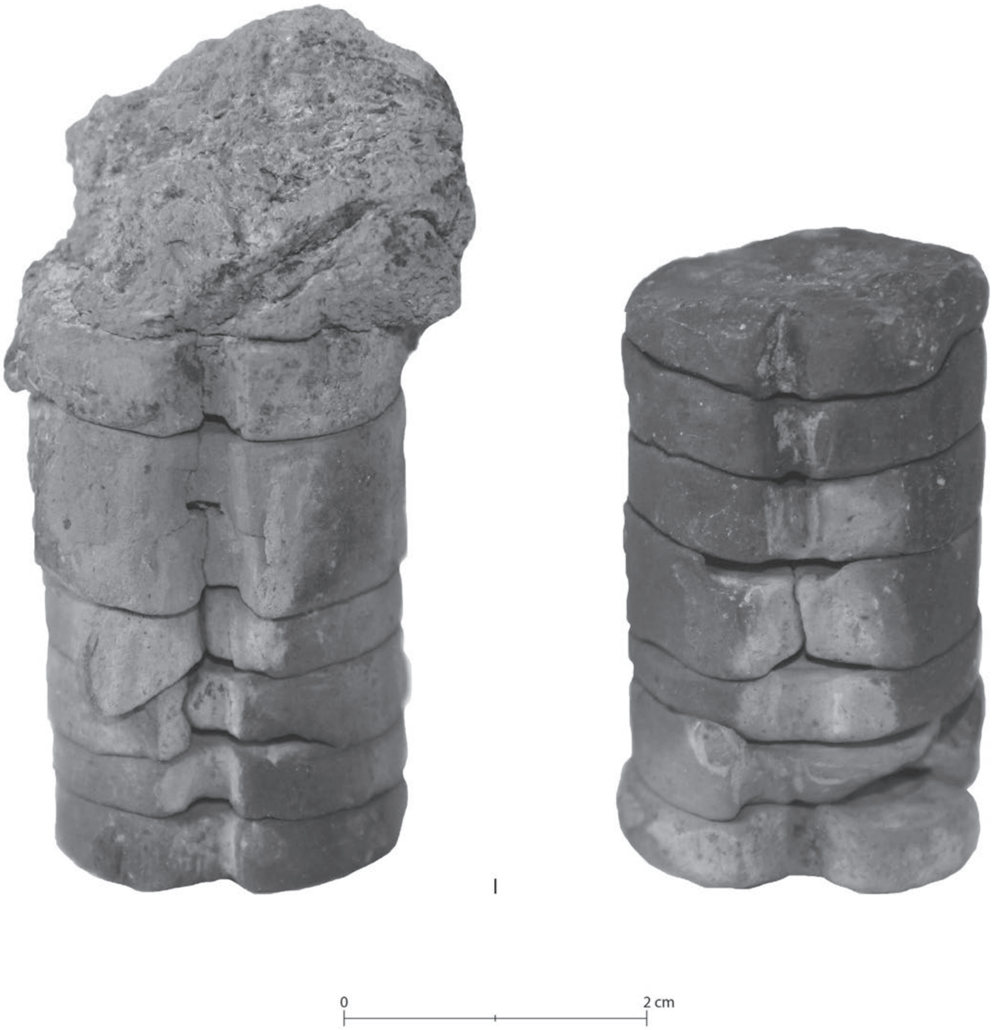


Figure 2.10. Reconstituted piles with moulds coming from lot 2 (photos: La Riobé).

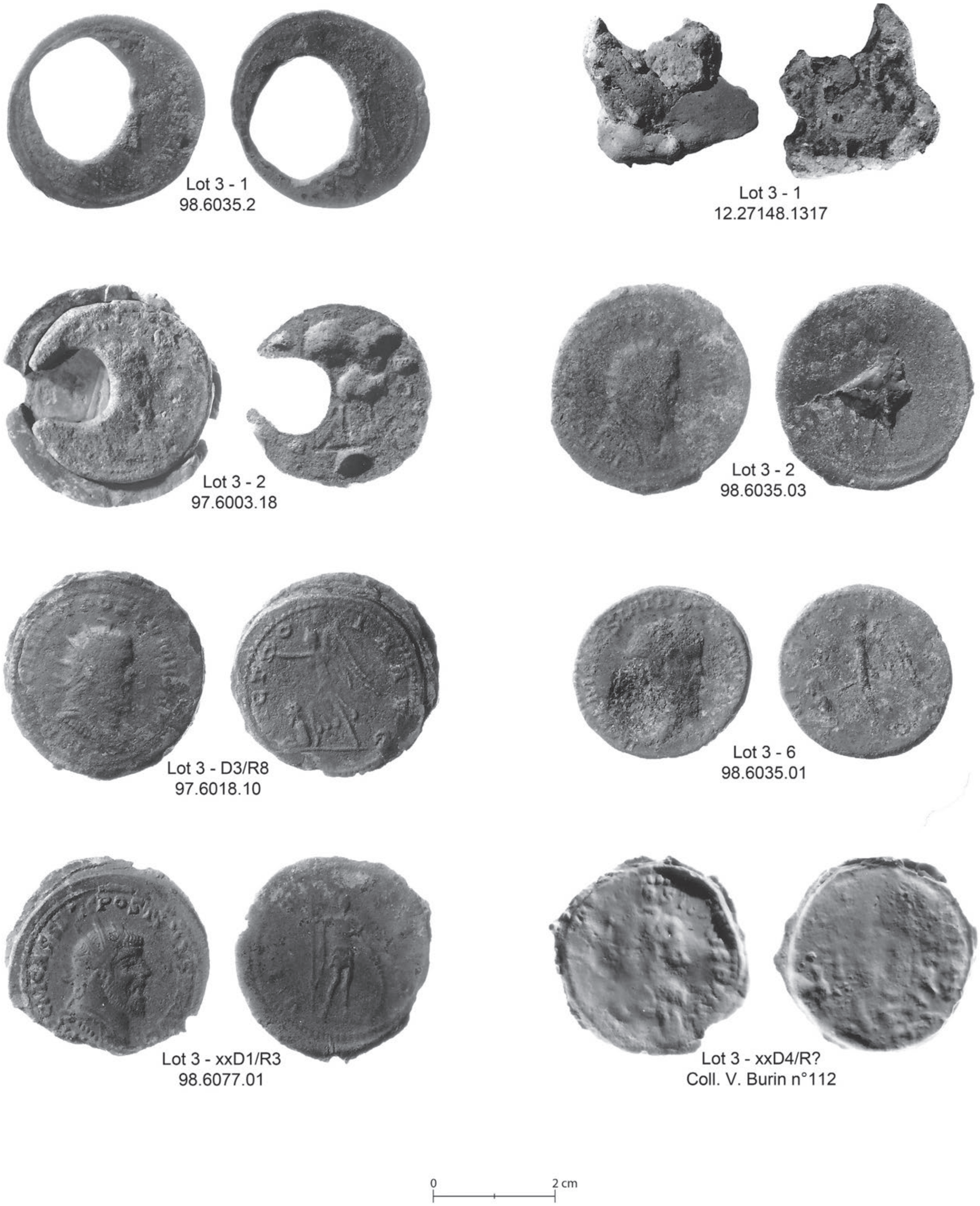

Lot 3 - 1
98.6035.2
Lot 3 - 1
12.27148.1317
Lot 3 - 2
97.6003.18
Lot 3 - 2
98.6035.03
Lot 3 - D3/R8
97.6018.10
Lot 3 - 6
98.6035.01
Lot 3 - xxD1/R3
98.6077.01
Lot 3 - xxD4/R?
Coll. V. Burin n°112
0
2 cm

Figure 2.11. Failed cast double sestertii from lot 3 (photos: D. Biasi).

metal. This means that the coins are likely to deceive their holders about their intrinsic value. The use of high tin contents, however, made the alloy brittle and led to manufacturing failures due to breakage. In the case of double sestertii, the metal used is a copper-tin-lead alloy with a high percentage of lead.

Dating of Production

Lot 4 of coin prototypes is later than 264, as the identified prototype coins were all used simultaneously, as indicated by the connections between moulds, and by the presence of Postumus's curly hair characteristic of issue 3b of the main workshop (264–266). However, the possible presence of an effigy of Tetricus II leaves doubt as to the *terminus post quem*. Moreover, the fact that lots 2 and 3 are associated, in a same primary deposit, with plated coins and blanks, as well as with stone plates for the casting of large bronze blanks, attests that they are contemporary and concomitant with the striking of silvered antoniniani and of double sestertii. The casting of denarii, antoniniani, and double sestertii from lots 2 to 4 of prototype coins can therefore be dated between 266 and 275, but certainly not much later if one considers the absence of archaeological contexts associating the production of radiates with terracotta moulds. In the absence of any proven link with these three sets, lot 1 may not be contemporary with the others and has to be placed in a broad chronological range (*c.* 240–275), during which the denarius was significantly undervalued compared to the antoniniani reintroduced in 238 and highly sought after by hoarders.

These elements and those associated with the percussion process testify to a first phase of coinage activity dated *c.* 263–271, initially dedicated to the striking of silvered antoniniani and denarii, and then combining the striking and casting of antoniniani, denarii, and double sestertii.

The next phase (*c.* 271–280s) saw the evolution of productions, on the one hand with the striking of antoniniani without silvering, and on the other hand with the end of that of double sestertii. The practice of casting was also abandoned in the first half of the 270s. The unverified mention of a mould bearing the effigy of Tetricus II contributes to the uncertainty about the dating of the event. Officina 1 only struck radiates after 275 and until the 280s, as well as in multiple workshops in the six provinces where the phenomenon had developed (Gallia Belgica, Gallia Lugdunensis, Germania Superior and Inferior, Britannia Superior and Inferior).

The Status of Imitations

Plated denarii and antoniniani are characterized by a vile core on which a more precious metal coating is applied, generally of the same nature as that of the official prototypes. Their main characteristic is that they resemble, sometimes to a fault, their official prototypes, whether they are prior to AD 260 for those of the Central Empire or to the reform of AD 268 for those of the Gallic Empire. They have a beautiful silvering, a great fineness of engraving, as well as correct masses and diameters. Their status is therefore, without any possible ambiguity and by definition, that of counterfeits, i.e. false coins since they are the result of an act of falsification and fraud. In this case, the falsification results from an alteration of the value of the denomination by modifying the title, with a silver coating on a copper core. Fraud is explicit, as this plating masks the absence of precious metal in the core, and thus deceives as to the real value of the coins and generates a profit for the issuers. The gain is easily quantifiable, of the order of 600 per cent under Postumus, since the fine content of imitations averages 3 per cent (for perfectly preserved hoard coins) compared to *c.* 18 per cent for official antoniniani minted before the devaluation of 268. In this production, the value of copper plays only a very small role compared to that of silver: in 301, for example, the price of a pound of silver was 120 times higher than that of a pound of ordinary copper (Lafaurie 1975, 115). These productions therefore naturally fall under the *Lex Cornelia de falsis*, which concerns the adulteration of official silver coinage, the practice of silvering as well as the putting into circulation of such coins. Their fraudulent nature is therefore proven on several counts. The problem of cast coins is much more difficult:

> 'The question has been discussed many times over the last three centuries and has been the subject of articles, papers, hypotheses, etc., of very unequal value and which, up to now, have not led to any conclusions' (Jungfleisch 1954, 239).

Research therefore invariably stumbles on the question of their status, and consequently on the question of their instigators. Some believe that we are dealing with a genuine counterfeit coinage, the result of a private decision, intended to deceive the user about the intrinsic value of his coinage. But others see it as a coinage of necessity initiated by civil or military powers, all the more tolerable because it would have compensated for a deficient official supply or at least helped do so. This is the case with D. Gricourt, who considers that, except in a few specific cases, cast coinage was not the work of counterfeiters in search of profits but rather responded to a need for necessity coinage in specific, 'epidemic' regions and times of money shortage (Gricourt 1993, 563), for example an increased need for local coins in the Gallic territory (Schmid, Peter, and Deschler-Erb 2011, 129). M. R.-Alföldi considers that the poor-quality products of Pachten could not deceive anyone and did not bring any profit to the craftsmen who forged them (R.-Alföldi 1971). The most recent developments on this category of imitations come from G. Aubin, who envisages private coinage, without excluding 'the possibility of linking the activity to the needs of the army, but rather to pay requisitions than to pay soldiers' wages' (Aubin 2003, 142–43, 147). It should be noted that the involvement of the army is particularly debatable, as there are numerous discoveries of moulds in a military context (Gricourt 1993, 564–66).

In this context, what is the contribution of the research carried out at Châteaubleau? First, it shows varied activity, with three species reproduced by casting at the officina 1: denarii, antoniniani, and double sestertii. This fact is unique for these three denominations, but other workshops also diversified their production: those of Saint-Mard and Pachten are famous examples. More importantly, this practice coexists in officinae 1 and 3 at least, with a striking activity and in particular with silvered antoniniani which are, as shown above, fake coins. This observation is certainly decisive in recognizing as counterfeit coins the cast denarii and antoniniani issued between AD 266 and 275. This hypothesis was already suggested by the use of a tin-rich bronze. Such an alloy leads to a drastic alteration of the value of the denomination by modifying its title, which is null in the present case, as well as to an outright fraud since the metal chosen gives the illusion of a silvered title. This conclusion is also perfectly consistent with the explicit prohibition of the purchase and sale of lead or tin coins by the *Lex Cornelia de falsis*. Moreover, no link can be established with a situation of monetary shortage or any military activity during the second and third quarters of the third century. At Châteaubleau, the intention was not to combat a lack of local coinage, which was then mainly made up of large and medium-sized bronzes more or less worn, but to issue counterfeits for the sole benefit of their instigators, casting being in the end only one production technique among others.

The involvement of the army in the manufacture of cast money may be in some cases questionable. Coinage was not part of the army's remit, since the payment of wages was the responsibility of the financial procurators of the provinces or, in very special cases, of the administration of a city (Rossignol 2014). In addition, the consequences of such a practice, to pay for the services or benefits of civilians in 'monkey money', would have been rather harmful to the reputation of the Roman state.

> Only in specific situations, for a limited period of time and in relatively low demand, was there any reason to cast coins. Rather than some dishonest craftsman seeking a limited profit, the geographical area, the frequency, and the small quantities lead us to believe, very generally, in the decision of a local official (military rather than civilian) trying to combat a shortage of cash. (Schwartz 1975, 208)

This is for example the case of a bronze coinage (sestertii, dupondii, asses) signed by the Legio III Cyrenaica and minted in Bostra between AD 140 and 144 to provide for its needs in a newly conquered region (Hollard 2004). This is also the hypothesis for the production of cast Severian denarii discovered in the Levant region (Gitler and Ponting 2003, 31–41), probably motivated by the authorities' imperative need to pay local recruits demobilized around AD 203, a few years after the Parthian War led by Septimius Severus. These coins have the peculiarity of being made of a lead-rich bronze (about 20 per cent), and of a silver-copper alloy with a higher rate of fineness than that used in imperial mints.

But in the context of the north-western provinces, what shortage could it be, given the limited circulation of pre-253 denarii and antoniniani in the third quarter of the third century? These species account for only a few per cent of the pre-275 site coins (excluding radiates), and the cast specimens constitute only a fraction of them. In hoards, this imitation coinage is even absent or represented in insignificant quantities. In the case of the latter, it is possible that individual initiatives on the part of soldiers, involving small volumes and intended for personal profit, are more easily envisaged. This could be the case at Arras, where several hundred moulds have been exhumed from a chalk extraction pit along with military equipment (Gricourt 1990, 100–01; 1993).

Who Benefits from the Crime in Châteaubleau?

As a result of our work (Pilon 2016, 199–212), we have concluded that it was appropriate to locate at Châteaubleau the great counterfeiters' mint named 'Atelier II' by P. Bastien (1967, 39–44, 77–89), issuer of plated antoniniani and of the majority of the imitated double sestertii put into circulation during the reign of Postumus, i.e. several million coins. This production volume as well as the remarkable longevity — nearly twelve years — of this counterfeiting phase (*c.* 263–275) argues for its promoters possessing significant power. This is compatible with the *postestas* of the municipal magistrates and their autonomy in governing their community, the emperor only intervening against movements affecting the Empire or territories at the level of the province or group of provinces (Lamoine 2009, 46, 166, 352–53, 377). In the absence of official embassies to inform him, the traffic could continue. With our current state of knowledge, the criminal responsibility of magistrates of the city of Sens, landowners in Châteaubleau, and possible benefactors, is only a conjecture, as is the contribution of the sanctuaries to the supply of metal. But these assumptions are at least compatible with the importance of the monetary activity, its durability, its integration in the town, its proximity to the central cult complexes, and its inevitable visibility and audibility.

Moreover, if its promoters were high dignitaries of the *civitas*, this could only have facilitated the transition from the production of counterfeit coins to necessity coins, with the minting of radiates in a set of six provinces that heralded the future dioceses of Gaul and Brittany.

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FRASER HUNTER

3. Counterfeit Denarii North of Hadrian's Wall: Roman or 'Barbarian'?

ABSTRACT Four aspects of counterfeit denarii in Scotland are considered: the evidence of counterfeits themselves, of votive denarii, of moulds, and of barbarian imitations. Counterfeits are rare and found primarily on Roman military sites, part of the wider circulation of such fakes within the Roman monetary system. A unique hoard of tin denarii from a well at Bar Hill is best seen as material created for religious deposition. Moulds are known from three find-spots, all beyond the Roman frontier at the time, but it is argued that the intended market lay within the Roman world although production was safely beyond it. The technology of the moulds is identical to that known elsewhere, indicating these were Roman-trained craftworkers, not local metalworkers. There is no evidence of local imitations of denarii: although denarii came north as subsidies and political gifts, and most likely played a role as prestige goods, there was no demand for copies. In contrast to much of the continent, these denarii had very short circulation lives in Scotland.

KEYWORDS Scotland, coin moulds, votive coins

Introduction

The area of Britain north of Hadrian's Wall (Scotland and Northumberland in northern England) offers a particularly interesting study area because of the shifting Roman frontier (for a summary, see Breeze 1982). In the late first century the Roman frontier lay deep in north-east Scotland; in the early second century it pulled back to northern England, and was formalized in stone with the building of Hadrian's Wall; but in the mid-second century, for only around twenty years, southern Scotland was reoccupied. Thereafter Hadrian's Wall formed the frontier of the province until the early fifth century, although there was continuing Roman interest in the north and further military expeditions. This changing relationship means one must be careful with both the chronology and the social context of finds: are they coming from Roman military sites or Roman Iron Age (local) ones, and was the area within or outside the Empire at the time?

This paper will consider four aspects of counterfeit denarii: their presence within both military and local contexts in Roman-period Scotland; the remarkable evidence for ritual (rather than counterfeit) denarii from one Roman site; the evidence of moulds for casting fake denarii, posing the question of whether the makers and audiences for these were Roman or 'barbarian';[1] and the question of how the local Iron Age population interacted with denarii, both official and unofficial.

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[1] 'Barbarian' is used as a shorthand for the local non-Roman populations of the area, as is common in continental scholarship, without attaching any value judgement to these complex Iron Age societies. 'Iron Age' or 'Roman Iron Age' are used as preferred alternatives.

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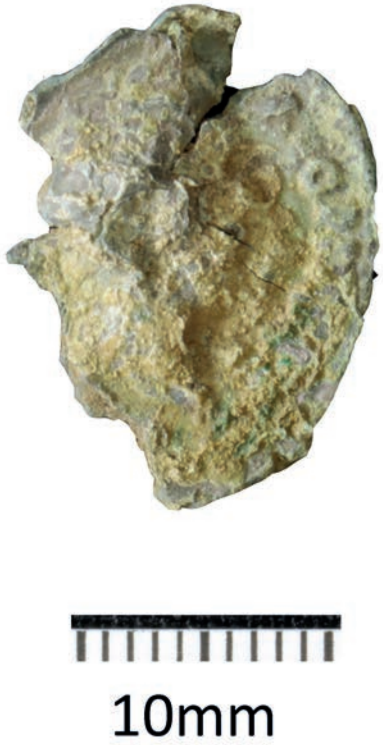

Figure 3.1. Struck cliché copy of a Flavian (?) denarius with silver foil over a lead-tin core from Birnie, Moray (coin 315) (© National Museums Scotland).

Counterfeit Denarii in Roman and Non-Roman Scotland

Older scholarship did not always spot fake denarii, yet it is clear that they were a small but recurring part of the coinage circulating within Roman Scotland during the occupations, as they were across the Roman world. Coin finds in Scotland have been synthesized regularly since 1918, but none of the early surveys identified any counterfeit material apart from the remarkable hoard of tin denarii from Bar Hill, discussed below;[2] only in 1989 were plated denarii first recorded (Macdonald 1918; 1924; 1934; 1939; Robertson 1950; 1961; 1971; 1983; Bateson 1989; Bateson and Holmes 1997; 2003; 2006; 2013; Savage and others 2021; 2022). It is likely that plated coins in poor condition were rarely reported by finders or were deemed unrecognizable in site assemblages. They were also rare. Only nine have been recorded from Roman fort sites, with none among the 157 denarii recorded from Newstead, the largest site assemblage in Scotland, and only two among the seventy denarii published from the Antonine Wall.[3] Of the 137 stray finds of denarii currently recorded, only three are counterfeits.[4]

Recently studied hoards have revealed occasional copies within them. In the two denarius hoards from Birnie (Moray), found on an Iron Age site and totalling over three hundred denarii each (ending in issues of 193 and 197), there were two counterfeits: a struck cliché copy of what was probably a Flavian denarius with silver foil over a lead-tin core (Fig. 3.1), and a cast copy of a denarius of Domitian (Holmes 2006; Eremin and Tate 2006). These fakes were an integral part of the coins received from the Roman world, not any local attempt to make imitations. The cast coin is the first such recorded from Scotland; studies of moulds have shown that, while most date to the third century, there is evidence for the making of casts in the first–second centuries as well, which must provide the context for this find (Chameroy 2007, 541).

Ritual Replicas: Tin Denarii from Bar Hill (East Dunbartonshire)

Before turning to evidence for the manufacture of counterfeit denarii north of Hadrian's Wall it is worth

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[2] A remarkable cast forgery of a very rare seven-denarius piece of Hadrian, found in an old handbag on the dump near Lerwick, Shetland, is mentioned by Anne Robertson (1983, 417). This 'medallion' is now lost, but Donal Bateson supplied images of a cast of it in the Hunterian Museum, and Richard Abdy (British Museum) confirms it was a modern forgery. I am grateful to them both for resolving this tantalizing mystery (though how it ended up in a handbag in Shetland remains a puzzle), and to Brian Smith and Ian Tait (Shetland Amenity Trust) for considerable detective work on the find.

[3] Nine plated denarii are recorded from six Roman forts: Bar Hill, East Dunbartonshire (one of Hadrian, RIC 267a, from the fort and another the same from the well deposit discussed below; Abdy 2002, 203 no. 6, 204 no. 39); Castledykes, South Lanarkshire (Domitian; Bateson 1989, 167 no. 16); Elginhaugh, Midlothian (hybrid of Vespasian and Vitellius; Bateson 1989, 167); Inveresk, East Lothian (Hadrian, from the fort; M. Aurelius (cf. RIC 399; AD 178–179) from Newhailes, very close to this military complex; Bateson and Holmes 2006, 163; Bateson 1989, 169); Milton, Dumfries and Galloway (Republican, RRC 427/1; Bateson and Holmes 1997, 530); and Strageath, Perthshire (A. Pius, Severus (the site was not occupied in the Severan period; this may represent troops passing through during the Severan campaigns); Frere and Wilkes 1989, 139 no. 40; Bateson and Holmes 2006, no. 164). For Newstead, see Holmes 2012, table 1; for the Antonine Wall, Abdy 2002.

[4] Plated denarius of Trajan from Fairnington, Scottish Borders, close to the line of a Roman road (Bateson and Holmes 1997, 529); a pierced, plated Republican denarius (RRC 294/1) from Auchenheath, South Lanarkshire (Bateson and Holmes 2003, 248); and a 'copy' (technology not stated) of Antoninus Pius from Forglen House, Aberdeenshire (Treasure Trove records; TTDB 2017/170).

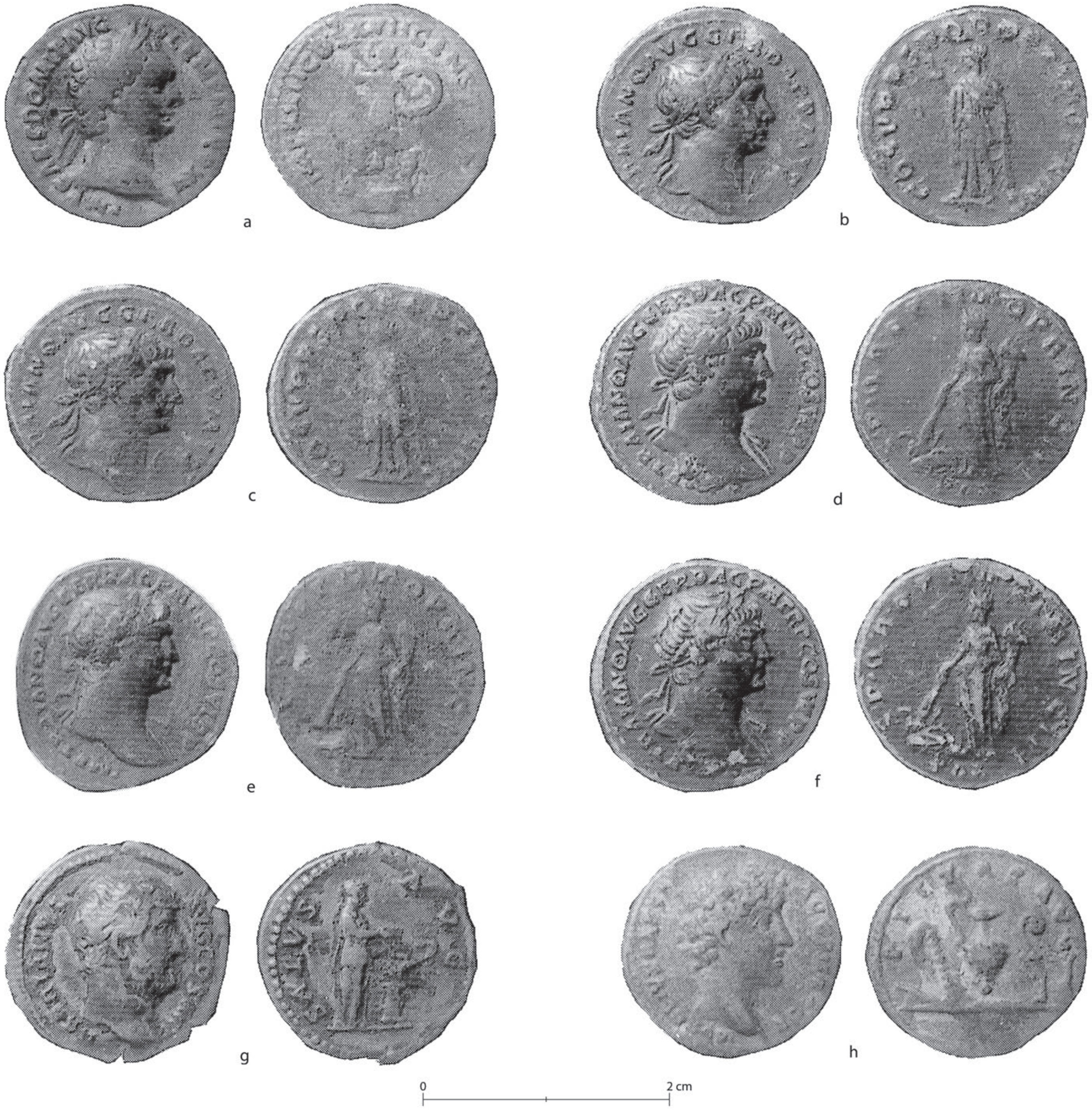

Figure 3.2. Selection of votive denarii deposited in the well at Bar Hill. Coins d–f are made from the same mould. a Domitian (RIC 191), tin copy. b Trajan (RIC 127), tin copy. c Trajan (RIC 127), tin copy. d Trajan (RIC 259), tin copy. e Trajan (RIC 259), tin copy. f Trajan (RIC 259), tin copy. g Hadrian (RIC 267a), plated. h Antoninus Pius for M. Aurelius (RIC 424a), tin copy (photos by Richard Abdy; reproduced courtesy of the Hunterian).

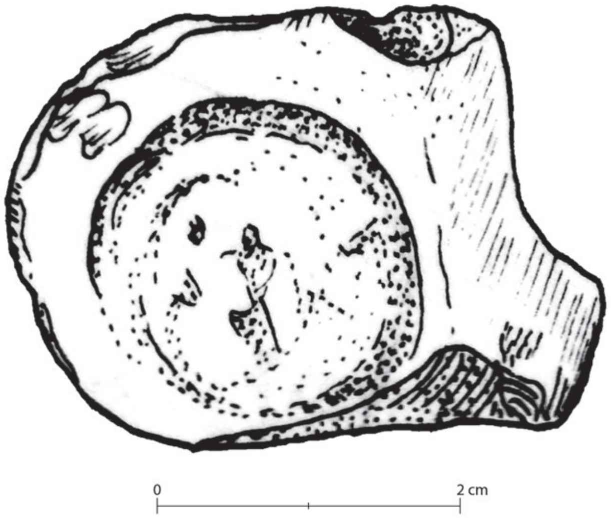

Figure 3.3. The shale mould from Bar Hill showing a standing figure; probably used for making denarius copies (Robertson and others 1975, fig. 13 no. 60).

drawing attention to an old and remarkable find. In the 1902 excavations of the fort of Bar Hill, on the Antonine Wall in central Scotland (occupied *c.* AD 140–165), the well within the *principia* was cleared out. The waterlogged conditions produced a wealth of finds, but for current purposes the most remarkable came from the basal sediments, where a hoard of thirteen denarii was found (Fig. 3.2). Two were official issues (M. Antonius, Vespasian), one a plated copy (Hadrian), and ten copies of tin rather than silver (one each of Domitian and A. Pius, eight of Trajan). Five of the Trajan issues are from the same mould. Sir George Macdonald suggested they were made on the spot for votive deposition (MacDonald 1905; MacDonald and Park 1906, 107–10; see also Robertson and others 1975, 169–73; Robertson 2000, no. 206; Abdy 2002, 196, 204; Bland 2018, 171 no. 715). They came from the basal silts, and must have been deposited when the well was in use, before the backfilling when the fort was abandoned. The quantity of similar coins in this non-functional material supports interpretation as a ritual deposit into a watery spot, most likely when the fort was constructed.[5] In this official context in the heart of the fort, it is hard to see it as the disposal of counterfeit material. There is other evidence from Roman Scotland of coin hoards as foundation offerings: the Flavian fort at Elginhaugh (Midlothian) had a denarius hoard inserted in the foundation trench of the headquarters building, with the coins being a carefully made selection dominated by much older Republican issues (Bateson and Hanson 1990; Bateson 2007, 263–70).

Evidence for the manufacture of such copies also survives from Bar Hill: from the same well came a shale mould with a circular impression showing a standing figure (Fig. 3.3; Robertson and others 1975, 48 fig. 13 no. 60; Macdonald and Park 1906, 91). Surface X-ray fluorescence analysis failed to reveal metal traces, but this is not unusual with moulds, especially ones which have been in museums for over a century. It is notably less well-defined than the designs on the copies, suggesting it was not for these, and implying that other copies were made for deposition elsewhere. It represents a very different moulding technology from those discussed below.

This idea of making coins specifically for deposition is attested elsewhere, for instance in the bronze as copies found in the sacred spring at Bath (Somerset), or lead-alloy copies of Severan denarii from a river deposit at Piercebridge, Co. Durham, several of which were deliberately folded or mutilated (Walton and Moorhead 2016, 841; Eckardt and Walton 2021, 137–38).

Denarius Moulds North of Hadrian's Wall

Clay moulds for denarii are a familiar find in Roman Britain as elsewhere in the north-western provinces. They were summarized by George Boon in 1988, and while more recent finds and studies have added to the picture, they have not materially changed its character (Boon 1988; see also Hall 2014; updated distribution in Chameroy 2007, Abb. 2 — based on Aubin 2003, fig. 4; and the overview by Richard Brickstock in this volume). The evidence from south of Hadrian's Wall is dealt with elsewhere in this volume by Richard Brickstock; here we focus on finds from north of the Wall, but it is worth noting that they are rather sparse in the military zone of northern England, with examples known in small numbers from Housesteads (Northumberland) and Binchester (Co. Durham) (Chameroy 2007, table 1 nos 66, 77; Brickstock, this volume). North of Hadrian's Wall, clay moulds are known from three find-spots (Fig. 3.4). They are discussed from south to north; numismatic details are given in Table 3.1.[6] All represent the typical form, with stacks of disc moulds in cylinders, and groups of cylinders (often three stacks) held in an outer casing and cast together (Boon 1988, 107–10).

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[5] The latest coin, of Antoninus Pius for Marcus Aurelius (RIC 424a) dates to AD 140–144 (Abdy 2002, 204 no. 40); The fort would have been constructed around AD 142, so it is likely to be a foundation offering.

[6] Three of the finds were reviewed by Nick Holmes and the writer previously, while the fourth was published by Nick Holmes subsequently; numismatic identifications rely on his expertise (Holmes and Hunter 2001; Holmes 2012, 133).

Excavations in 1992/1993 at Brighouse Bay (Dumfries & Galloway), on the northern shore of the Solway Firth, found Roman Iron Age occupation levels within a sand dune. The excavations were constrained by the demands of a pipe trench, so the area excavated was small, but the finds included a single coin mould (Fig. 3.5). Small, worn sherds of Roman pottery were also recovered (Boon 1994; Maynard 1994, 20, 23–24). This looks like episodic and temporary activity close to the shore, rather than a settlement. In his report on the find, George Boon argued that the most likely market for the counterfeits was the Roman world which lay some 40 km across the water to the south-east, and this remains the most likely explanation.

Two moulds have been found at the Roman fort of Newstead (*Trimontium*, Scottish Borders). Both are stray finds, recovered casually, and their precise find-spots are unknown. One was found around 1940, taken to Australia by the finder, and then returned to the local museum in 1998. The other had been given to John Casey of Durham University for study at an unknown date; he passed it to National Museums Scotland shortly before his death, but its find circumstances are entirely unknown. The moulds could represent two separate episodes of counterfeiting, but it seems more likely that they stem from the same one. The site has been fieldwalked intensively since the 1920s (e.g. Elliot and Hunter 2012, 181), so if there was a major dump of moulds, more would have been expected to appear.

One find comes from the end of a stack, with one blank face and another showing a worn denarius of Antoninus Pius (Fig. 3.6). The other is double-sided, with an obverse of a denarius of Caracalla (AD 199–200) and a reverse of an antoninianus of Aurelian (AD 271–275).

The fort at *Trimontium* saw a long occupation in two separate episodes, *c.* AD 78–105 and *c.* AD 140–185 (Hanson 2012). There is evidence of later visits by Roman troops (or at least, by people using Roman finds), notably an intaglio of Caracalla which was probably lost in the Severan campaigns into east-central Scotland in 209–210 (Elliot and Henig 1999, 395 no. 36, illus. 3), and a small number of late Roman coins (Holmes 2012, 132); these low-denomination coins rarely came into local hands, suggesting they were lost by people participating in the Roman economic system, most likely military scouts or similar expeditions. Thus, the episode of counterfeiting (if it is a single episode) took place at a former Roman military site, not one actively occupied. However, the finds of third- and fourth-century coins point to continuing use of the fort as a stopping point on the old Roman road, and it is likely that the counterfeit coins made their way south on the same road.

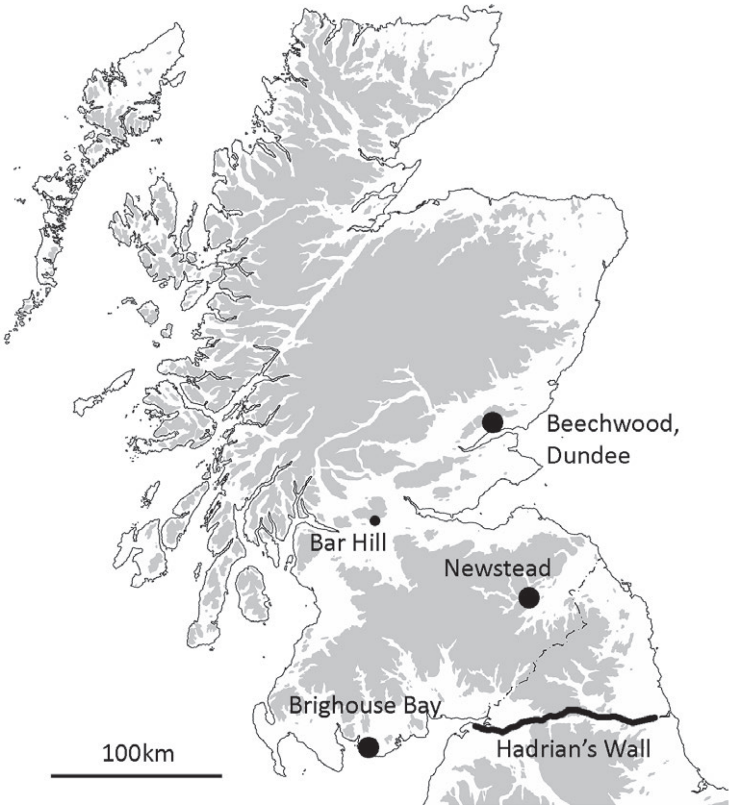

Figure 3.4. Find-spots of denarius moulds from north of Hadrian's Wall (large dots) and the Bar Hill deposit (small dot) (by author).

The final discovery has the least satisfactory history, as it was a casual find in 1960 within a pile of rubble at Beechwood, on the west side of Dundee. Clearly this was not where it was originally deposited, and the source of the rubble is unclear, but there are no strong grounds to argue that it had been carried any considerable distance; it was found within an area of housing with gardens, and it is likely that the find came from the immediate area. It is double-sided, with an obverse from a denarius of Caracalla much like the Newstead one, and reverse of an antoninianus of Gordian III (Fig. 3.7).

There was no Roman presence anywhere nearby by the time of Gordian III, although a short-lived legionary vexillation fortress was established at Carpow, some 20 km upstream from Dundee, in the Severan period. It was one of only two permanent Severan military bases in Scotland, the other being on the southern shore of the Forth at Cramond. Nick Hodgson has argued plausibly that the two sites represented outposts supported by sea (Hodgson 2014, 45–46). No later coins are yet known from Carpow, but some are from Cramond (Robertson 1983, table 2; Holmes 2003, 98, table 9), and it is possible that Roman scouts or expeditions

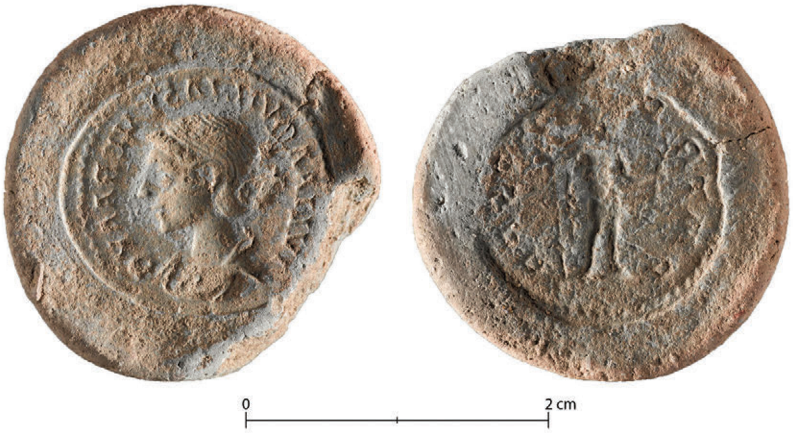

Figure 3.5. The two sides of the mould from Brighouse Bay. Diameter 25 mm (© National Museums Scotland).

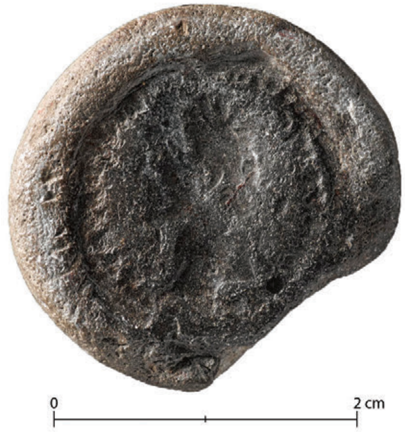

Figure 3.6. The second coin mould find from Newstead. Diameter 26 mm (© National Museums Scotland).

continued to use the base on occasion. Thus, a Roman market for these counterfeits is not impossible.

In first presenting these finds, Nick Holmes and the writer were puzzled by the mix of denominations being made simultaneously: by the 270s, for instance, a denarius would be viewed with some suspicion as it was (notionally) of silver rather than the silver-washed base metal antoninianii then in circulation. Subsequent works have made it clear that this was not unknown: moulds of Aurelian are very rare, but Gérard Aubin noted one from Corseul (Côtes-d'Armor/France) with a very similar combination of coins, while Jérémie Chameroy's detailed tabulation of mould assemblages reveals many other examples with a mix of denominations and a broad time range, concentrated from the Severan dynasty to Postumus (Aubin 2003, 131, 147; Chameroy 2007, table 1). It is a notable feature of the larger mould assemblages that they show simultaneous production of quite a range of denominations, and presumably the forger felt they could pass them off safely in circulation, with such a demand for small change that little attention was paid to the details. For instance, the find of over eight hundred moulds from 85 London Wall, London, included bronze coins ranging from Trajan to Trebonianus Gallus and denarii from Septimius Severus to Gordian III, with a single example of Faustina I (Hall 2014).

The Scottish finds thus slot into a wider picture where people in the north-west frontier provinces were making counterfeit denarii, primarily in the later third century. The technology involved was identical with that attested elsewhere, suggesting someone well-versed in Roman craft techniques rather than a local craftworker. There is also no sense that the intended audience was local. Denarius hoards had been part of frontier diplomacy from the time of Antoninus Pius until Severus Alexander, but there is no evidence that these coins were still in circulation by the later third century; the latest coins are notably unworn compared to similar hoards from continental Barbaricum (Blackwell and others 2017, 25–26). There is also little sign that Roman coins had any local relevance in the later third century; a few concentrations of late third-/fourth-century coins have been argued to represent contact points with the Roman world, but this 'small change' was mostly discarded there and played little local role (Hunter 2010, 96–97 fig. 11.3). Apart from these clusters, in the period 238–293 only four coins are known from Roman Iron Age sites, while there are only some thirty plausible stray finds (excluding Alexandrian coins).

Thus, the audience for these counterfeits was southern; they were made beyond the normal extent of Roman control but with access into Roman networks to the south by road (in the case of Newstead) or by water (from Dundee and Brighouse Bay), and all lay within areas familiar to the Roman world.

Barbarians and Denarii?

Recent scholarship on denarii in continental Barbaricum has highlighted the widespread use of denarius imitations made beyond the frontier from Ukraine to Scandinavia (for instance, Stribrny 2003; Lind 2007, 2020; Dymowski 2019). There is no evidence for such a phenomenon beyond Hadrian's Wall. Denarii came into local hands in the area in some quantity, especially in the later second and early third centuries, as the distribution of denarius hoards shows. However, there is no evidence for extended circulation of these coins. They appeared in the area, most likely diplomatic gifts or subsidies within the context of frontier politics; they saw minimal

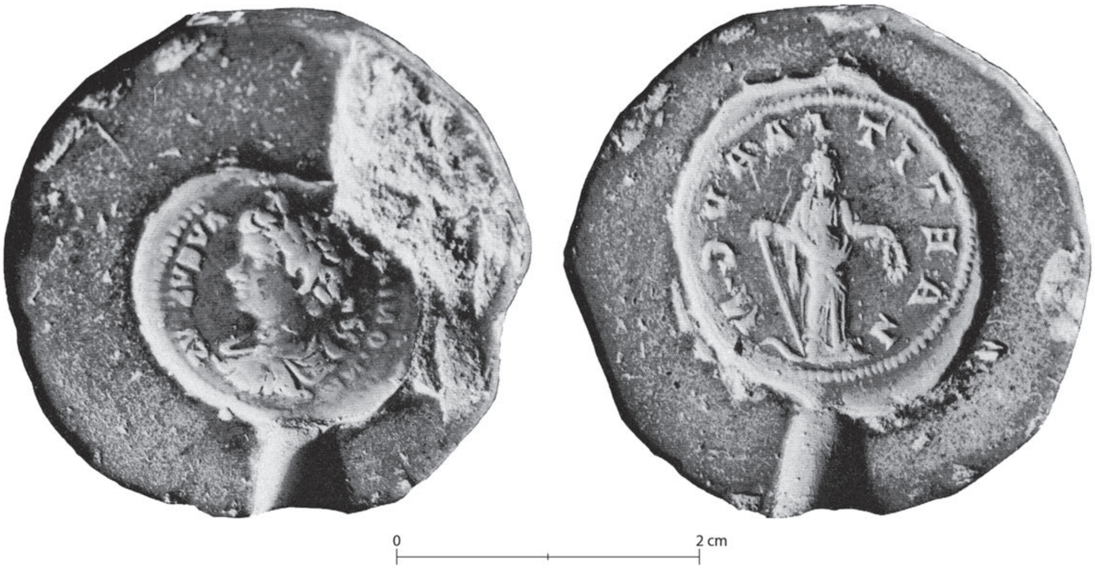

Figure 3.7. The two sides of the coin mould from Beechwood, Dundee. Diameter 35 mm (© The McManus: Dundee's Art Gallery & Museum).

Table 3.1. Details of the four moulds for denarii and antoninianii known from Scotland.

Find-spot	**Site**	**Face 1**	**Face 2**	**References**
Brighouse Bay	Activity in sand dune	Obv. Elagabalus for Aquila Severa (RIC 225–31; AD 220–221)	Rev. Severus Alexander (RIC 7; AD 222)	Boon 1994; Holmes and Hunter 2001, 168
Newstead 1	Former Roman fort	Obv. Caracalla (RIC 31–51; AD 199–200)	Rev. Aurelian antoninianus (Milan, AD 270–275)	Holmes and Hunter 2001, 169
Newstead 2	Former Roman fort	Obv. Antoninus Pius; worn, type uncertain	Blank	Holmes 2012, 133 fig. 12.4
Beechwood, Dundee	Stray	Obv. Caracalla (RIC 31–51; AD 199–200)	Rev. Gordian III antoninianus (RIC 86; AD 241–243)	Coutts 1971, 78 pl. 8; Holmes and Hunter 2001, 168–69

circulation (single finds are quite rare beyond the area of Roman control); and they were buried, in at least some cases most likely as deliberate offerings (Hunter 2007; Blackwell and others 2017, 19–29). There was thus no need for copies; there was no sustained local demand for these coins, and there is no sign of direct contacts with continental Barbaricum which might have influenced how the 'island barbarians' viewed this material.

This major difference in the way that denarii were used in Barbaricum is a topic meriting further work. In the context of this volume, though, three conclusions can be stated quite simply. Counterfeit denarii were not manufactured by local societies beyond Hadrian's Wall. The evidence for the manufacture of such counterfeits uses Roman technology and dates to a time when coinage saw no significant local use; they represent fakes made beyond the Roman world but intended for use within it. While counterfeits do occasionally appear in denarius hoards beyond the frontier, they are an insignificant phenomenon, representing the typical small percentage of fake coins present in circulating Roman coinage at the time. Denarii may have been valued in Iron Age society, but they were not copied.

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MARIO SCHLAPKE

4. Non-official Roman Denarii in Thuringia

The Finds from the Germanic Settlement of Frienstedt

ABSTRACT This article deals with the Roman denarii from Frienstedt that have been identified as forgeries or imitations. Twenty-six pieces, and thus more than 25 per cent of the 102 Roman denarii recorded so far, are plated, cast (mostly in non-ferrous metal but also in silver), or have visibly barbarous designs. Thus, imitative pieces form a large and significant proportion among the denarii from this important Germanic settlement of the first to at least the fourth centuries AD in Thuringia. Official and non-official denarii seem to have been used together here, demonstrating a phenomenon that has also been observed and studied at other sites in the Central European Barbaricum.

KEYWORDS Thuringia, Frienstedt, Germanic settlement, Roman denarii, imitations, plated denarii, forgeries, cast denarii, barbarous imitations

Site and Finds

The current Free State of Thuringia in Germany did not at any time lie within the borders of the Roman Empire, but was part of the Barbaricum, or Germania magna, beyond the limes.[1] However, the focus of current archaeological research is limited to possible Roman activities during the period when Roman troops were present in the region.[2] Finds of Roman coins have long been known in Thuringia and been documented for almost four hundred years. An overview of the extensive inventory is given in FMRD XIII (recording deadline: 'Winter 2000' (winter 2000), see FMRD XIII, 28) and for the part of Thuringia covered by CRFB Germany, vol. 8.1 (1: 'Materialaufnahme endete am 31.12.2007' (Material recording ended on 31.12.2007). The numerous new finds of the last decade(s) in Thuringia are mostly still unpublished. The article is intended to make a small contribution to this process (see Schlapke 2021, where the other imitations of Roman coins from the site are also briefly presented).

The site of Frienstedt is located near Erfurt in central Thuringia and is divided by the river Nesse into a smaller northern and a larger southern area. The Nesse is also the boundary between the present-day districts of Gottstedt and Frienstedt in Erfurt (Fig. 4.1).[3]

The site is estimated to cover a total of 12 ha (Schmidt 2014, 7), and an area of about 4 ha, located along and adjacent to the course of the present-day A71

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[1] Thankfully, this paper was subsequently included in the volume on the conference 'Exploring the Impact of Rome beyond the Empire: Imitations of Roman Imperial Coins'. Dr Wigg-Wolf is thanked for help with the translation. The manuscript was finalised in April 2023.

[2] Roman campaigns in Germania (12 BC–AD 16): the site of Schwabhausen, Gotha district (Grasselt 2009; Grasselt and others 2018, 64–67) and the sites Bollstedt and Reiser, Unstrut-Hainich district (Schierl 2021, 16, 54). Perhaps in connection with the Harzhorn event in the 230s: the marching camp of Hachelbich, Kyffhäuserkreis (Küßner and Schüler 2014; Schierl 2021, 21).

[3] As a result, the site is listed in the TLDA under two site numbers: Frienstedt, site 2 for the larger southern part, and Gottstedt, site 6 for the northern part.

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Counterfeits, Imitations, and Copies of Roman Imperial Denarii: Making and Faking Coins on Both Sides of the Limes, ed. by Arkadiusz Dymowski and Kyrylo Myzgin, WSA, 8 (Turnhout, 2024), pp. 49–65. This is an open access chapter made available under a CC BY-NC 4.0 International Licence.
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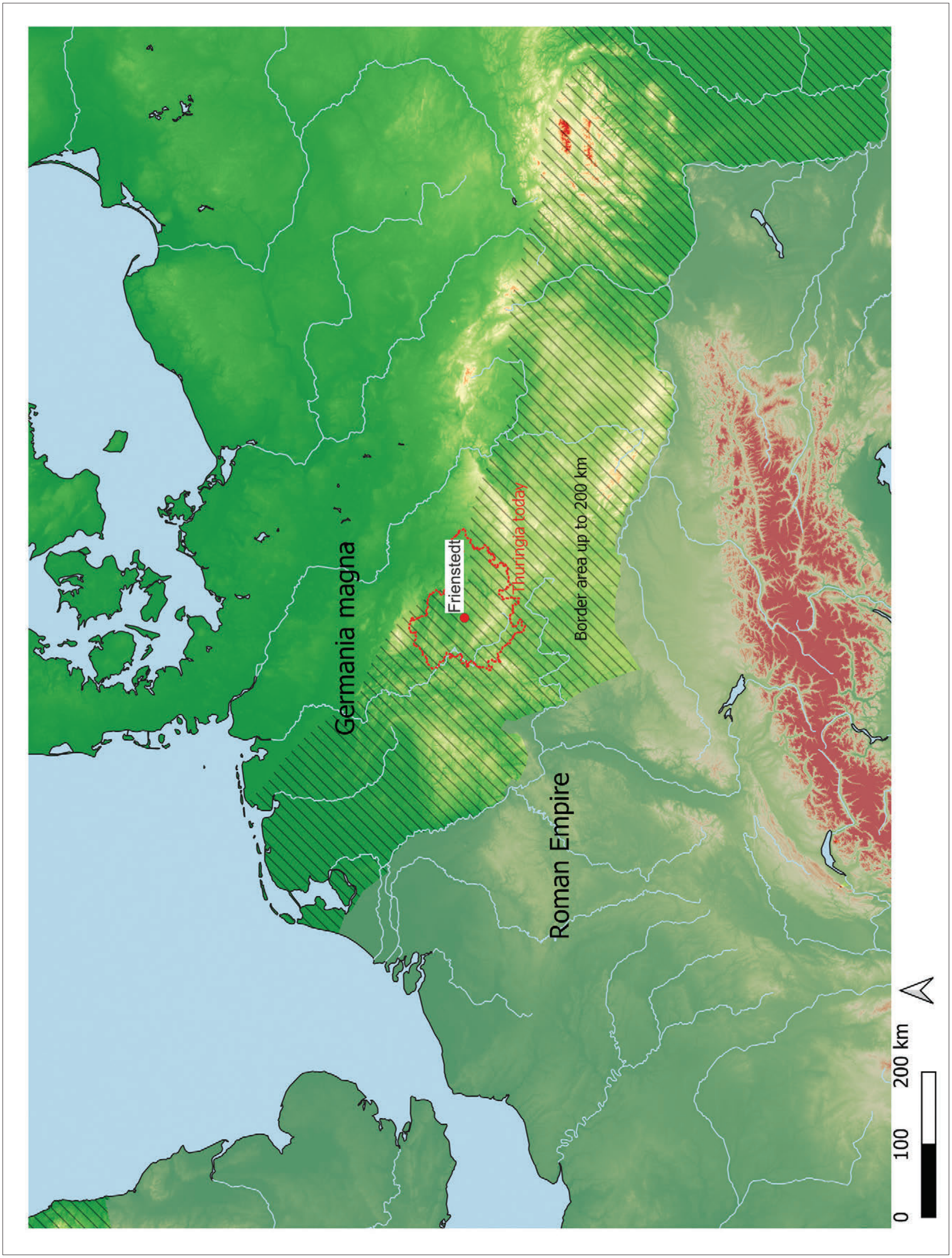
Germania magna
Frienstedt
Thuringia today
Border area up to 200 km
Roman Empire
0
100
200 km

Figure 4.1. Map of Frienstedt (with outline of Thuringia) and limes + 200 km 'border area' (copyright: author, map basis: © GDI-Th and <https://cartographyvectors.com/map/826-roman-empire>).

motorway between Schweinfurt and Sangerhausen, was excavated by the Thuringian State Authority for the Preservation of Historical Monuments and Archaeology (Thüringischen Landesamtes für Denkmalpflege und Archäologie, TLDA) before the start of construction in the years 2000 to 2004. The surrounding area was surveyed with a metal detector, and the site continued to be intensively supervised by the TLDA.[4]

The investigations revealed a Germanic settlement of the first to at least the fourth centuries AD that is one of the most important settlements of this period in Thuringia known today.[5] It was thus settled during the period of the Rhine-Weser Germanic culture in Thuringia and the Elbgermanic culture that replaced it in the second half of the second century.[6] According to current knowledge, settlement ceased at the end of the fourth or beginning of the fifth century AD.[7] However, an ancient damaged three-knobbed brooch ('Dreiknopffibel') in the find material indicates that the site was frequented until the second third of the fifth century AD.[8]

In addition to the settlement sequence documented by the outlines of houses, it is above all the cult shafts and the central graves arranged around them which have been documented that make the site stand out from the surrounding settlement area in central Thuringia, and certainly suggest a local central site.

Besides the finds recovered during the excavations, there are a large number of metal small finds, many of them in the plough soil above the archaeological features. These were discovered and mapped as part of a systematic metal-detector survey. The site thus occupies a special position in Thuringia, as it was the first time that a long-term prospection — before, during, and after the actual excavation — was carried out here, including adjacent areas.

The high proportion of metal finds of Roman origin indicates wide-ranging connections to the Roman Empire, the contemporary frontier of which, the Upper Germanic-Raetian limes, ran some 160 km distant from Frienstedt.[9] Local metal processing[10] was an important economic aspect of the settlement. Among the find material, a three-layer comb made of red deer antler from the third century AD with the oldest known runic inscription in Thuringia to date (Schmidt and others 2011 and 2013; Steuer 2021, 1252) and an anthropomorphic ceramic figure with a possible reference to Roman cult rites (Sukalla 2005; Nüsse 2011; Bemmann 2016; Steuer 2021, 645) stand out.

A total of at least 210 Roman coins[11] of all metals and denominations in use at the time, including 101 denarii, are now known from the settlement and its surroundings (Fig. 4.2). The numismatic find inventory has been made accessible via the KENOM project and can be accessed online for the two TLDA sites of

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[4] The numismatic material from these prospections is recorded under TLDA process numbers 13/323 and 14/56. In addition, there are two pieces whose whereabouts are currently unknown. A denarius of Marcus Aurelius, minted 168/169 according to the obverse legend TR P XXIII, and an antoninianus of Volusianus, RIC IV.3 Volusian 141, minted in 253. As well as a new find from 2022 there is a denarius of Lucius Verus (RIC III Marcus Aurelius 515, TLDA inv. no. 13/323-105). Thanks are due to Mr Sukalla, Erfurt, for his kind information.

[5] Schmidt (2014, 44 figs 101–05) structured the settlement with different areas of use into two early phases (phase 1: 'ab Ende 1. Jh. nach Chr.' (End of first century AD), phase 2: 'B2 spät' (B2 late), phase 3 'die C1 entspricht' (which corresponds to C1), a phase 4 which 'C2 entsprechen dürfte' (C2 should correspond to), and the last phase 5, which corresponds to C3. Chronologically, the period around 100 to the end of the fourth century AD is covered here (absolute chronological dating of the Eggers stages according to Lund Hansen 1987, 30). Departing from this, Schmidt 2013, 169 and 170 fig. 1 places the beginning in period B1 'mithin der zweiten Hälfte des ersten Jahrhunderts' (the second half of the first century), as does Steuer 2021, 226, referring to this for the dating: '50 bis gegen 400 n. Chr.' (AD 50 to around 400). According to the kind information of Mr Wulf Walther, Wandersleben, the types of fibulae present in the find material (described as 'Altstücke' (Old pieces) in Schmidt 2014, 92) make a settlement in the 'Zeitstufe B1b ca. ab 15/20, wenigstens aber vor Mitte des 1. Jhs.' (Period B1b ca. from 15/20, but at least before the middle of the first century) and thus at the beginning of the Rhine-Weser-Germanic culture in Thuringia probable.

[6] This process coincides in Thuringia with the time of the Marcomannic Wars, which are certainly indirectly related to it.

[7] Thus, continuing into the chronological phase D1. Dr Ostritz, Weimar, and Mr Walther, Wandersleben, are thanked for their assessments and references to the Niemberg brooches available from the site (Schmidt 2014, 113–14).

[8] See TLDA inv. no. 5408/03 (Schmidt 2014, 93, 352 no. 690, pl. 49, 690), which can be placed in phase D2. Thanks are extended to Mr Walther, Wandersleben, for pointing out this previously unrecognized piece.

[9] <https://www.luftlinie.org/50.487222,8.784444/50.969203,10.922864> [accessed 22 November 2022] gives a linear distance of 159.77 km. The coordinates of Arnsburg-Alteburg fort on the Wetterau limes (Muschenheim, municipality of Lich, Hesse) and the Nesse crossing of today's BAB A71 were used for the calculation.

[10] See for this, among other things, two miscasts of non-ferrous metal buckles (Schmidt 2014, 136).

[11] The author's incomplete list of coins contained in Schmidt 2014, 628–57 reflects the state of work at that time. The 'CRFB vorauss.' (CRFB expected) references provided there are only the internal numbers of the initial recording. A final numismatic publication and evaluation of the material is still pending.

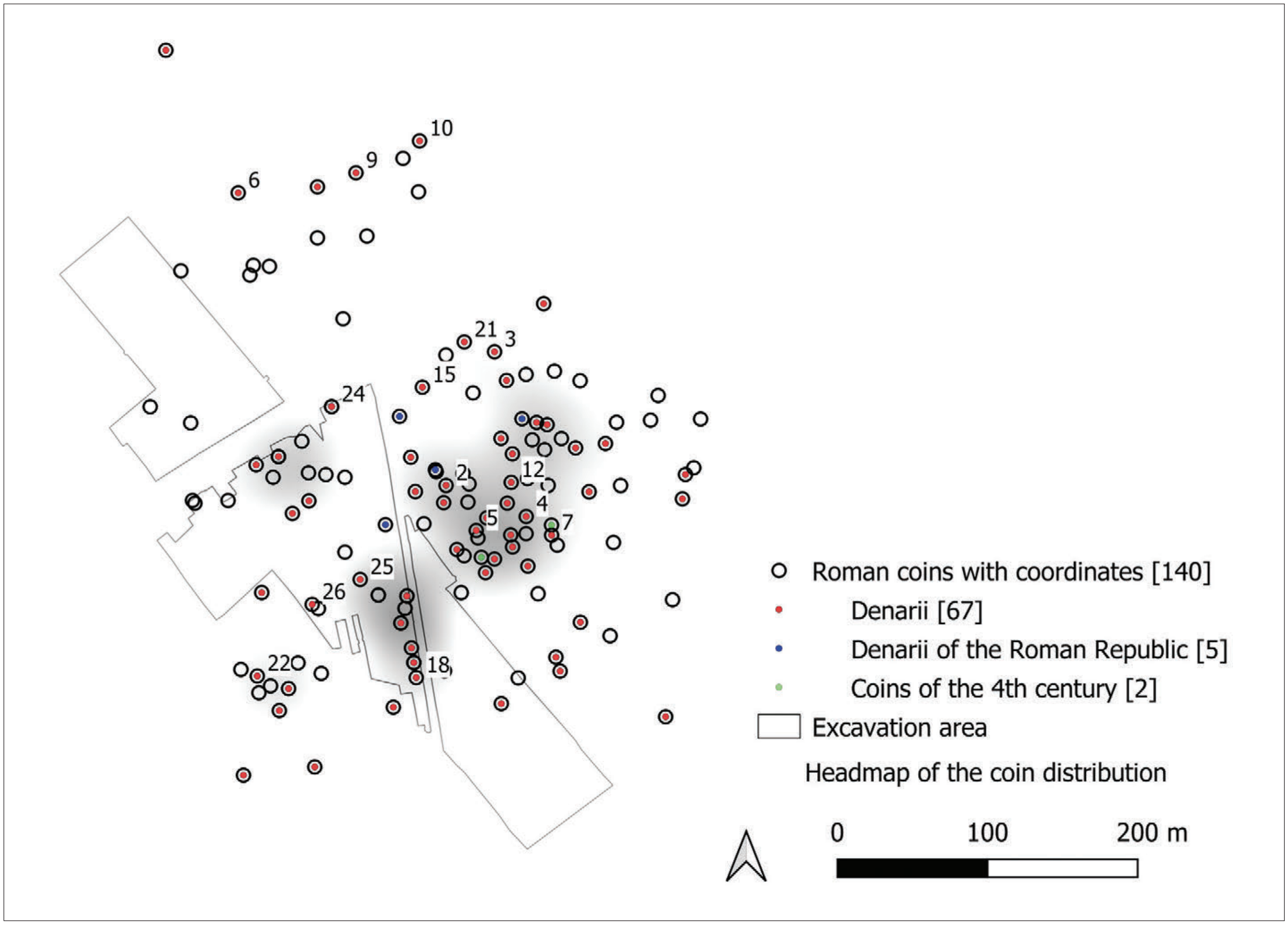
10
9
6
21
3
15
24
2
12
4
5
7
25
26
22
18
Roman coins with coordinates [140]
Denarii [67]
Denarii of the Roman Republic [5]
Coins of the 4th century [2]
Excavation area
Headmap of the coin distribution
0
100
200 m

Figure 4.2. Mapping of the imitative denarii (as far as sufficiently locatable) together with all mappable coins of the settlement. Also marked are the finding points of the oldest coins (republican denarii) and those of the two coins of the fourth century (copyright: author, map basis: TLDA Weimar, Archäologisches Landeskataster).

Frienstedt and Gottstedt. It is divided technically into four find complexes.[12]

The series of ancient coins from the site begins with denarii of the Roman Republic from the last two centuries BC, coins which were in use in the Barbaricum for a long time.[13] The most recent pieces are two AE coins of the fourth century.[14] The main focus of the coin series from Frienstedt lies in the second half of the second century: the time of the Antonine dynasty (AD 138–192); as well as in the third century: the time of the soldier emperors and especially the Gallic Empire (AD 260–274).

During the identification work, it became apparent that besides official Roman coinage a larger number of very different, non-official coins are present. In the case of the denarii, of the total of 101 coins of this denomination approximately 25 per cent (= twenty-five pieces) are not official.[15] They can be divided into fourteen plated pieces, ten cast, and four barbarous denarii, whereby two pieces[16] were counted twice, as plated and barbarous.

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[12] Available online via FK/NK numbers 20320, 20337, 21572, and 21586 at <https://numismatische-kommission.de/fundkatalog/fundkomplexe> [accessed 30 January 2023], they also served as the basis for the compilation in Schwinghammer 2020.

[13] See for example in Thuringia the find of a denarius (probably Craw. 158/1) in a cremation grave of the late second century AD in Altengottern (Walther 2008, 140).

[14] The widespread absence of coins from the 290s onwards confirms the observation of H.-U. Voß (2001, 443) regarding the coin series in central Germany: 'Auffällig sind Lücken bzw. Fundrückgänge in [...] diocletianischer und constantinischer Zeit.' The latest coin in the find complex is an AE3 of Valens (TLDA inv. no. 8969/04), minted at Siscia in 364–367.

[15] In addition, there are imitations of antoninianii, including minimi, mostly of originals from the Gallic Empire, which are not considered further in this article. At least four imitation antoninianii: TLDA inv. nos 4316/01, 2551/04, 5580/04, 8873/04 and at least two minimi: 1554/02, 13/323-2.

Plated Denarii

There are a total of fourteen such pieces in the find material: cat. nos 1, 2, 6, 7, 9, 10, 12, 18, 19, 22, 23, 24, and 26. The status of cat. no. 3 is at present uncertain.[17]

Among them, coins of the Antonine dynasty dominate (Antoninus Pius, including Faustina I: five examples; Commodus: four examples), with one each of the earlier emperors Augustus and Nero and the later emperors Septimius Severus and Severus Alexander. The high proportion of Antonine coinage is also found in the overall spectrum of finds of official denarii in Thuringia.[18]

Cast Denarii

Ten cast denarii were recognized in the find material from the settlement: cat. nos 4, 5, 11, 13, 15, 16, 17, 20, 21, and 25.

With eight examples, coins of the Antonine dynasty also dominate here (Hadrian for Antoninus Pius Caesar: one example; Antoninus Pius for Faustina I: two examples; Marcus Aurelius, including Faustina II: three examples; Commodus: two examples). One coin of Trajan also dates to the second century. One cast coin is based on a denarius of Septimius Severus for Geta from the beginning of the third century.

Lead or tin bronzes, which have good casting properties, were mostly used for production. Two pieces were cast in silver (cat. nos 16 and 17).

Barbarous Denarii

The find material includes three secure pieces: cat. nos 1, 8, 14, and one uncertain piece: cat. no. 3.

Still very close to the original is the slightly barbarous, plated Gaius and Lucius denarius of Augustus, which is only evident in the poor execution of the inscription.[19] Conspicuous is a central piercing, 4 mm in diameter.[20]

Two typical barbarous denarii in silver are based on originals of Antoninus Pius and Faustina II. The degree of abstraction in the motifs, especially on the reverse, is very pronounced. In particular, the coin of Antoninus Pius is a very free interpretation, also of the portrait. The inscriptions on both pieces are strongly abstracted.

Cat. no. 3 is recorded as a possible non-official coin. The combination of two left-facing laureate busts of Vespasian and Titus or Domitian (?) on a pierced coin with a high silver content, does not seem to occur as an RIC type for denarii, or in RPC as a drachma. Unfortunately, the legends are only preserved in remnants, so that currently it cannot be better identified.[21]

Technical Aspects of the Identification of Non-official Denarii

In the detection of cast and plated denarii in non-ferrous alloys, scientific investigations[22] are of great importance, especially in conjunction with comparative investigations of official Roman denarii.[23]

In the case of plated pieces, non-destructive material analyses of the surface in cracks or over larger areas with high-resolution micro-XRF[24] are particularly helpful where the silver sheath is damaged today and so the copper or copper-rich and silver-free core material[25] can be detected.

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[16] Cat. nos 1 and 3.

[17] Current scientific analysis and the density value (see the Catalogue) suggest that the coin is plated, but this has to be checked in further investigations. I would like to thank Dr Mecking, Weimar, for the measurements and discussions.

[18] The evaluation by H. Schubert (2011, 348 fig. 217) shows that almost 30 per cent of all silver coins in Thuringia recorded in FMRD XIII date from the second century.

[19] There seems to be no connection here with the group of heavily barbarous Gaius and Lucius denarii mainly found in Thuringia (find evidence in Sicherl 2016, 235 and Walther and Schierl 2018, 119 n. 62). Given the current state of research, the question of the origin and dating of these pieces must remain open; on this topic, see also Chantraine 1985, 385–85 and Dymowski 2019, 152–53. Sicherl (2016, 229) and Walther and Schierl (2018, 107) see the possibility of local coinage by Cherusci who had migrated to this area (as bearers of the Rhine-Weser Germanic culture) from AD 17 onwards.

[20] The piercing is reminiscent of an as of Augustus from Sanne, Lkr Stendal, Saxony-Anhalt, which was also pierced, but with a smaller hole of 2.7 mm diameter (FMRD X, 90, no. 1110, 1; Laser and Ludwig 2003; Meller 2015).

[21] A (cast) imitation with two obverses would also be conceivable (friendly advice from Dr Wigg-Wolf, Frankfurt am Main).

[22] Here my special thanks go to Dr Mecking (head of the archaeometry laboratory at the TLDA) and Mr Hägele-Masnick (chief conservator at the TLDA).

[23] For Thuringia, reference should be made here to the material analyses of the denarius find from Schwabhausen (final coin 230–235, see <https://numismatische-kommission.de/item/4e567018-fba5-4768-a46c-5d06764a3694> and <https://chre.ashmus.ox.ac.uk/hoard/3113> [accessed 17 November 2022]) in Henning/Mecking 2007, 242–44. A similar investigation was carried out for the Ammern hoard <https://chre.ashmus.ox.ac.uk/hoard/17474> [accessed 17 November 2022] (Mecking 2024).

[24] This distinguishes these small-scale and well-defined copper-rich areas from large-scale copper presence on the surface of surface-enriched pieces or copper-rich deposits that can form as a result

Non-destructive material examinations with micro-XRF reach their limits when the silver sheath is intact, as they cannot normally penetrate the plating or other silvering that has been applied.

In addition to the weight, density measurements can provide a further clue. The density depends on the proportion of the metals silver (density 10.49 g/cm^3) and copper (density 8.92 g/cm^3) in the coin.[26] If the values are clearly below the density of silver (10.49 g/cm^3) and alloys with a high silver content, then it is likely that the core is made of or alloyed with another material with a lower density, in this case mostly copper. The measured density cannot fall below the density of the core metal (theoretically)[27] (Mecking 2011, 340). In the cases examined (see Catalogue), the densities are below 9 g/cm^3, with the exception of cat. no. 2.[28]

Further possible analyses could involve X-raying the coins, which might reveal air inclusions (for this, see Mecking forthcoming) as the cause of deviations in the density measurement, or production- or corrosion-related changes between the core and the shell, e.g. at the edges.

With non-destructive material analyses of the surface, non-ferrous metal imitations ((mostly) cast denarii) can be easily detected and distinguished from pieces made of silver. Washed-out structures resulting from casting are often visible, while the coins are often chipped as a result of stress cracks resulting from an alloy that is too hard and brittle.[29] Some pieces also appear to have been tinned in order to enhance their silvery appearance.[30] The material analyses of the Frienstedt pieces revealed various copper-multi-material alloys with significant proportions of tin and lead, which are described in the catalogue as tin bronzes or lead bronzes, depending on the higher content of tin or lead.[31]

Evaluation

With fifty-six[32] examples, the 102 denarii known from Frienstedt have their main focus on the coins of Antoninus Pius to Commodus, and thus match the strong influx of denarii during or after the Marcomannic Wars that is clearly recognizable in the find material from the Barbaricum generally (Bursche 1994). The period from AD 193 onwards is still represented by twenty-seven denarii.[33] In addition, there are eight antoniniani of good appearance and comparable in weight and diameter to the denarii struck until the early 250s.[34]

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of corrosion. What remains to be investigated is the possibility of copper deposits that form during conservation and the use of wet-chemical compounds such as Komplexon III.

[25] The results of the non-destructive, near-surface analyses of the Frienstedt pieces reveal copper as the core material without any major proportion of other metals. This contrasts with the investigations of five pieces from the settlement of Jakuszowice, where examinations of the core revealed a bronze with 15–20 per cent tin and 5–10 per cent lead (Bursche 1997, 35). The flans of plated denarii from Augusta Raurica examined by Markus Peter (1990, 81–98) consisted of tin bronzes with a significant lead content, but with a great deal of variation of the individual elements. Further investigations on the Frienstedt pieces are certainly necessary in order to clarify this observation.

[26] Kraut and Stern (2000, 53 fig. 2) shows a graph of the calculated densities corresponding to the quantity ratios in a silver-copper system.

[27] In practice, the measurements can result in lower densities than expected due to air inclusions in the coins, despite a high silver content; for this, see the investigations on the coins of the Erfurt turnosene find and the evidence there of foamed silver with micropores, which, despite a high-quality silver alloy, are responsible for a measured density of sometimes less than 8 g/cm^3 (Mecking 2011, 340–42). Systematic measurement errors that lead to values slightly below the calculated density must also be taken into account (Mecking forthcoming).

[28] The piece shows the copper of the core at one bubble point, so that a subaerate structure is assured. The measured density value seems to indicate a relatively strong silver plating, so that arithmetically about 20 per cent of the piece still consists of silver (see also the diagram in Kraut and Stern 2000, 53 fig. 2).

[29] An example of this is a cast denarius from Wangenheim, district of Gotha (TLDA inv. no. 05/139-43, model: RIC II Trajan 165 or 156), which shows various radial cracks in the X-ray image as well as chips resulting from them. The material examination revealed tinning on a lead bronze (TLDA lab. no. 20/06). Another denarius from the same site (TLDA inv. no. 09/376-2, model: RIC III Antoninus Pius 351a) is comparable in appearance and the break.

[30] See the cast denarius from Wangenheim, Gotha district (TLDA inv. no. 05/139-32; model: RIC II, pt 1 (2nd edn) Domitian 690) with tinning on a lead bronze (TLDA lab. no. 19/06) presented in Mecking and Schlapke 2008, 106–07 and fig. 8.

[31] See also the compilation in Chameroy 2007, 540, and the reference there to the fact that silver-containing alloys (silver contents of 30 to 50 per cent) were also found, at various times and places. However, the two pieces from Frienstedt that were recast in silver are to be distinguished from these; the examination of cat. no. 17 revealed a silver content (on the surface) of 92 per cent.

[32] The coins were counted on the basis of the emperors and their relatives to be seen on them, without taking into account the question of whether the respective piece is official or not (forgery or imitation).

[33] The antoniniani up to Volusian (251–253) were included in the number. A total of fifty-five antoniniani are present, including minimi and uncertain pieces.

[34] The plated denarius of Commodus (cat. no. 19) and an antoninianus of Volusian (TLDA inv. no. 3962/02), which were ‘found together’ during the prospections in the northern area, unfortunately without their location being recorded exactly, could provide an indication that denarii and their imitations, as well as early antoniniani, were used together in Frienstedt. The

The non-official denarii from Frienstedt cover the entire spectrum of such pieces, and occur here together with official coinage.

There are classic plated pieces that mostly copy the originals closely and well. They can be assumed to be of a directly fraudulent character and can thus be addressed as contemporary forgeries. Mechanical reproduction methods using existing (mostly official) coins could be used for the production of such dies, either by casting a die or else striking a coin directly into a blank die, often combined with re-engraving of the legends and details (Stribrny 2003, 62–64). The silver which gave the coin its value was replaced by a core of non-ferrous metal, and only a thin layer of silver was applied to plate it. It can be assumed that they were produced by specialized craftsmen in the Roman Empire, but possibly also in the Barbaricum itself. As long as they were not recognized as lower-value pieces, they could circulate together with official denarii. It can be demonstrated that they were produced at the same time as the originals they copied were in circulation,[35] but also locally until the middle of the 270s.[36] In addition to plated pieces, alloys with a reduced silver content were also used, the silver content of which was then increased by treatment of the surface in order to simulate a full-value silver coin. Recently, the production of plated (barbarous) denarii has also been proven in the eastern Barbaricum, with production beginning at the end of the third century (Dymowski 2020, 172).

In addition, there are cast denarius copies, which were produced in large numbers in the north-western provinces of the Roman Empire, above all Gaul and Britain, using clay moulds which are known in large numbers, mainly from the middle of the third century onwards (Peter 2008, 390; 2011, 113–15) based on the occurrence of clay moulds with impressions of antoninani. By using original coins as models, the cast pieces are only recognizable from the distinctive metal, which will originally have been silver-coloured (tin or lead bronzes with tin content), and possibly combinations of obverses and reverse, so-called hybrids, that were not possible on official issues.

In the case of the cast denarii, there are pieces in the find material from Frienstedt that compare well with coins produced within the Empire that were cast using regular Roman denarii as models. This suggests an origin within the Roman Empire, and thus a possible date in the mid-third century[37] (Peter 2011, 115), which can also be assumed for the production of the examples found in Frienstedt.

The production of such cast copies using bronze alloys containing silver, or else silver-coloured, has also been proved for the Barbaricum (see, among others, Anokhin 2015, 10–13 for the area of the Chernyakhov culture in present-day Ukraine; Awianowicz and others, 132, map 2; and Sidarovich 2017, pl. 3.6 for the Wielbark culture in present-day Belarus). There are also new finds of cast denarii in Mecklenburg-Vorpommern, where silver was used as the casting material.[38] Reference can also be made to the Frienstedt pieces, cat. nos 16 and 17. In the case of cat. no. 16, a miscast would even be conceivable, since the row sides of the coin are not correctly aligned. It is difficult to date such copies of denarii in silver and non-ferrous metal produced in the Barbaricum, but they are certainly chronologically close to the struck barbarous imitations.

Struck silver imitations of Roman denarii which clearly originated outside the Roman Empire occupy a special place among the finds. They usually show clearly recognizable deviations in the design and corrupted legends, which lead us to assume that the die maker was not familiar with the Latin language and could only imitate the iconographical programme of Roman coins (the emperor's bust on one side and the representation of the gods on the other) in a simplified way.

Today known areas of manufacture and use are in Eastern Europe, especially in the area of present-day Ukraine and Moldova (Anokhin 2015, 70–204, lists 1080 pieces).[39] For Poland, forty-eight specimens have been found, nineteen of them in hoards (Dymoswki 2019). Likewise, more than forty specimens each have been found in north-western Germany, the Hungarian

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Kleinballhausen hoard (see FMRD XIII, 222, no. 1069 and 223, no. 1072, possibly also no. 1073), from which five pieces (three denarii of the Republic and Marcus Aurelius, an extremely barbarous Gaius and Lucius denarius of Augustus, and an antoninianus of Decius, minted 249–251) are still present in the coin collection of the LDA Halle, should also be mentioned in this context.

[35] For the workshop for the production of subaerate coinage in Augusta Raurica presented by Markus Peter, the production period could be established as 195–210 (Peter 1990, 91).

[36] See for example Chameroy 2007, 546, with reference to officina 1 of the counterfeit mint of Châteaubleau in northern France, where around this time the simultaneous casting and minting of denarii (see the lead test strike of a denarius obverse die of Maximinus Thrax, Pilon 2005, 795, 799 fig. 6) and antoninianii was abandoned in favour of minting imitations of antoninianii.

[37] Chameroy 2007, 545: 'Die Hauptphase des Denar-Nachgießens dürfte man also in den Zeitraum 240–270 legen' (The main phase of denarius recasting should therefore be placed in the period 240–270).

[38] I am indebted to Dr Wigg-Wolf, Frankfurt am Main, for this reference to finds of casts of Antonine denarii in silver and the investigations currently underway into possible local production using silver fragments cut from Roman silver vessels (<http://afe.dainst.org/findspot?afeid=3687> [accessed 30 January 2023]).

[39] On the website <http://barbarous-imitations.narod.ru/>, which Anokhin operates, 1526 imitation denarii are currently recorded (data access: 22.11.2022).

lowlands, and Gotland with Öland (see, among others, Stribrny 2003; Dymowski 2019; and Dymowski and Myzgin 2021). By means of die-links among the denarii, transregional connections can be identified across the entire Central and Eastern European Barbaricum (for a summary, see e.g. Dymowski 2019, 157–59; and Dymowski and Myzgin 2021, 204, maps 4 and 5). However, local production of barbarous imitations cannot be excluded. U. Werz (2021) has published an imitation of a denarius of Antoninus Pius and a flan from Jeinsen in Lower Saxony. In the find material from Frienstedt there are also two pieces[40] which could be considered as 'flans', but also various silver fragments (*Hacksilber*). Further investigations are necessary here to establish a possible connection to the local production of coins.

Often these imitations are found in hoards together with official Roman denarii, which suggests a function and use at least as a store of value. Possibly, the production of such imitations is connected with the continuing local demand for silver Roman denarii after the end of the regular minting of such pieces in the middle of the third century. What then remains unclear is an end date for the production of the imitations, which could extend for a long time. Thus, barbarous coins, where they are found together with originals, date such finds often significantly later than the originals imitated.[41]

Previous compilations of barbarous denarii in central Germany list fifteen specimens as single finds (Richter 2013, 44–45, map IX; Richter 2016, 54–57 fig. 16), of which only one imitation of a denarius from the second century was found in Thuringia.[42] Frienstedt has thus led to a significant increase, with three certain examples.

The dating of the settlement of Frienstedt to the first to fourth (or maybe fifth) centuries dates the denarius imitations and forgeries presented here only generally up to around AD 400 (or 450), based on the production date of the originals imitated. General statements on the periods of use of Roman denarii in Thuringia are also very difficult to make. The inclusion of a denarius of Commodus Caesar in a Merovingian grave from the end of the seventh century is a very late example.[43]

Only a total of nine of the coins recorded from the settlement come from features that have been examined archaeologically (Schmidt 2014, Catalogue of Finds, 279–657), and which can then serve as a basis for dating the use or loss of the coins on site.[44] Of the denarii considered here, only cat. no. 24 comes from a feature. Feature 444 in the southern area of the settlement is a shaft with a total depth of 3.55 m (Schmidt 2014, 224) and extensive find material, which the archaeologist responsible can only date approximately to the period between 250 and 310.[45] This fits well with the dating of the manufacturing focus of such cast denarii in the Roman Empire around the middle of the third century (Peter 2011, 115).

Sixteen of the twenty-six imitative denarii can be mapped with sufficient precision in the current state of processing by means of a precisely measured point or information on the find 'as in the vicinity of a feature' or similar information.[46] The map shows these pieces mainly in the southern settlement area; they are mostly detector finds from the areas not yet excavated.[47]

The settlement of Frienstedt is about 160 km as the crow flies from the limes (Fort Arnsburg at Wetterau-Limes) of the third century. It thus lies within a 200 km zone which is variously[48] regarded, following Tacitus,[49] as the transition between a buffer zone with what the Romans considered 'nearest neighbours' and the distant inner Germania. With this division, Tacitus separates Germanic peoples who valued Roman money in the form of denarii, who accepted gifts of money from the Romans, and also passed them on to each other, from the tribes who only knew (coinless) barter trade.[50]

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[40] Uncertain flans: TLDA inv. no. 5029/04 (lead, weight: 2.49 g, diameter: 11.9 mm) and 8867/04 (silver, weight: 4.01 g, diameter: 12.8 mm). For the silver fragments see Schmidt 2014, 123 and pl. 33.

[41] An example of such a combination is the hoard or cash hoard with five denarii that were originally corroded together from Bretleben, district of Sömmerda (CRFB 8.1, XVII-07-5 / 1.3; TLDA inv. no. 07/135-39), including an imitation of Marcus Aurelius (prototype RIC III Marcus Aurelius 171). In the case of the scattered denarius hoard from Ammern 2019, on the other hand, an imitation of Marcus Aurelius (TLDA inv. no. 19/431-38, prototype: RIC III Marcus Aurelius 163A var.) found near the find-spot of the hoard is classified as not belonging to it (Burisch 2024, 224–25).

[42] Schloßvippach (FMRD XIII, 202, no. 1035, 1; Marcus Aurelius for Faustina II, for the reverse compare RIC III Marcus Aurelius 668).

[43] Kaltensundheim, district of Schmalkalden-Meiningen, grave 1/1971 = grave 14B, dated '3. Drittel 7.Jh.' (Trenkmann 2021, 110) contained a denarius of Marcus Aurelius for Commodus Caesar, minted 177/179, see FMRD XIII, 299, no. 1194, 1, Martin 2004, 271, MI 3, and Trenkmann 2021, 375 and pl. 16.7.

[44] Deviating from this, Schmidt 2014, fig. 316 shows on the plan, in addition to sixty-four exactly measured find-spots with coins within the excavation area, a total of twenty-one locations with coins that were 'recovered' from features. This also includes the pieces that were found as survey or detector finds in the vicinity of features or from the spoil from features, or that were only discovered after the end of the excavation when the features were refilled. Here, the features are only used as an indication of the location of the coins in the terrain.

[45] Schmidt (2014, 69) dates feature 444 to his 'Zeitphase 4?'.

[46] These are cat. nos 2, 3, 4, 5, 6, 7, 9, 10, 12, 15, 18, 21, 22, 24, 25, and 26. Thanks are due to the former local head of the excavation, Mr Sukalla, Erfurt, for providing further coordinates.

[47] The sixty-seven mappable denarii from the site show a similar distribution with a focus on the southern part of the site and the area of unexcavated land to the east of the excavation.

[48] See Hedeager 1978; Berger 2008, 110 'wenige Tagesreisen vom Reich entfernt', Steuer 2021, 575.

[49] See the relevant passages on coins in his *Germania* written at the end of the first century AD (V. 4–5, XV. 3, and XLII. 2, Fuhrmann 2016, 8–11, 24–25, and 58–59).

With regard to the use of coins in the Barbaricum, Frank Berger (2008, 110) presents a four-stage system, which he places alongside the barter trade that continued parallel to it. On the one hand, he sees a 'herunter gebrochenen Münzumlauf' (broken down coin circulation) among the 'benachbarten' (neighbouring) Germanic tribes. North and east of this zone he recognizes places with an 'offensichtlichen Münzumlauf, aber wohl zu eigenen und schwankenden Relationen' (obvious coin circulation, but probably to own and fluctuating relations): in addition to single denarii, mainly small bronze denominations are found here, some of which were also cut up to provide lower-value units. Other 'gateway communities' (based on Bursche 2002 [2006], 3) are characterized by a high proportion of denarii in the finds. These denarii entered Barbaricum on a larger scale through subsidies or payments for troops by Marcus Aurelius and Commodus to various groups. Finally, there are extensive areas in Germania magna without copper coins but with individual precious metal deposits without a direct monetary function.

Frienstedt shows characteristics of different areas: it has a high proportion of denarii, but there are also bronze coins that were partially cut up. Whether this was done for the recycling of material that can be proven at the site, or whether they represent low-value monetary units, remains open. This certainly reveals a system using different denominations and thus a use of the coins in the sense of money in local circulation.[51] The high proportion of denarii, however, also shows aspects of a non-primarily monetary use as a store of value or transfer medium between communities; the cast and struck imitation denarii in silver also fit this picture, and are thought to indicate this function in more remote areas. The high proportion of plated pieces among the denarii (*c.* 13 per cent) is paralleled in the settlement of Jakuszowice in southern central Poland, where twenty-six of 101 denarii found in a settlement from the third to the mid-fifth centuries were plated (Bursche 1997, 24–25). According to the current state of affairs (Bodzek 2021, 37 table 1), twenty-seven plated pieces are now known from the site, out of a total of 116 ancient coins, in addition to eighty official denarii.

In Frienstedt there is also a significant proportion of coins struck in the third century, beginning with late denarii and their imitations from Septimius Severus to Severus Alexander (cat. nos 24–26), but also antoninianii of the rulers of both the Central and Gallic Empires,[52] whereby the latter may include imitations from Gaul that were only produced after the end of the Gallic Empire from 274 onwards (Chameroy 2009, 355), and which were to be found in local circulation at least until around 280 but probably even later (see Chameroy 2009, 325). On the question of the use of these coins in Frienstedt, reference should be made to an assessment by H. Steuer (2021, 575): 'Münzen strömten nach den Markomannenkriegen erst später also doch noch zahlreicher in manche Regionen Germaniens ein, weil die Germanen jetzt einen für die römischen Händler akzeptablen Gegenwert besaßen – römisches Geld.' (After the Marcomannic Wars, coins began to flow into some regions of Germania in greater numbers, because the Germanic tribes now had a currency that was acceptable to the Roman merchants — Roman money.) This means that some of these pieces, which mostly had little material value, could have been used as small change for the Roman goods that flowed into Barbaricum in great quantities at this time. Such goods also reached the region through trade and were paid for with the denarii of the second century that (still) existed here.

The extent to which these third-century coins and, of course, the denarius imitations presented here also laid the foundation for a continuation of coin use in the settlement of Frienstedt in the fourth (or even still in the fifth) century, but without any recognizable supply of current Roman coins, remains an open question given the current state of knowledge.

Four[53] pieces (cat. nos 1, 3, 4, and 17) among the finds presented here are pierced and thus indicate an (at least temporary) non-monetary use as pendants or, in the case of the centrally pierced cat. no. 1, as appliqués. In the case of cat. nos 3 and 17, the perforations on the rim seem to be aligned with the portrait on the obverse (approx. 12 o'clock), cat. no. 4, on the other hand, seems to be pierced arbitrarily (obverse: 5 o'clock, reverse 1 o'clock). Other coins among the finds are also pierced, and must be examined and evaluated separately.

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[50] On the general topic of Tacitus and Roman money in the Barbaricum see, among others, Kolendo 2008.

[51] Berger 2008, 110 summarizes the current state of knowledge: 'Tendenziell sieht es so aus, dass zumindest bis an die Elbe, aber auch darüber hinaus eine gewisse Geldfunktion römischer Münzen im einheimischen Zusammenhang deutlicher ausgeprägt war als wir bisher annehmen' (It appears that at least as far as the Elbe, but also beyond, a certain monetary function of Roman coins was more pronounced in the local context than we previously assumed.)

[52] These pieces, which are now also recorded in larger numbers from other sites in Thuringia and can mostly only be regarded as bronze coinage, are of great importance for a renewed evaluation of the special relationship of the population living here with the Roman Empire or the Gallic Empire. Erdrich 2001, 133 is still surprised by the small number of copper coins of the Gallic emperors in Thuringia that have been found up to now, see also the comments in Bemmann 2014, 183–84.

[53] The cavities on cat. no. 16 seem to indicate a miscast rather than to be actual piercings.

The coins from Frienstedt, together with other extensive series of Roman coins in Thuringia, facilitate further research on numismatically and archaeologically exciting questions in connection with original and non-original pieces, also against the background of the general question of the primary and secondary use of Roman coins and their initiations in areas outside the Roman Empire.

Catalogue of the Non-official Denarii

(The list shows the state of work as of 7 December 2022. In the course of future research, this may change)

1. Augustus for Gaius Caesar and Lucius Caesar
- Prototype: RIC I (2nd edn) Augustus 207, minted from 2 BC to at least AD 2; Lugdunum mint
- plated, legends barbarous, silver sheath partly pierced, coin perforated or pierced in the centre.
- TLDA inv. no. 3994/03; TLDA lab. no. 56/09 (two measurements: sheath and core)
- Silver plating, core: copper; weight: 1.99 g; density: 6.57 g/cm³.
- <http://hdl.handle.net/428894.vzg/2369f36d-add8-4530-8ebf-f9132465f9ac>

2. Nero
- Prototype: RIC I (2nd edn) Nero 60, minted 65/66; Rome mint.
- plated, silver sheath still largely intact, on reverse several spots on the surface blistered due to corrosion of the core
- TLDA inv. no. 8878/04; TLDA lab. no. 67/09
- Silver plating, core: copper?; weight: 2.93 g; density: 9.39 g/cm³
- <http://hdl.handle.net/428894.vzg/815130c3-2130-4d18-b128-cae77f1d751d>

3. Vespasian, for Domitian or Titus?
- Prototype: so far not ascertainable, image combination so not included in RIC or RPC (as drachma), general chronology: 69–79
- possibly imitation, plated?,[54] piece pierced at the edge
- TLDA inv. no. 13/323–50; TLDA lab. no. 158/14
- Silver plating?, core: copper?, weight: 3.41 g; density: 8.89 g/cm³
- <http://hdl.handle.net/428894.vzg/815130c3-2130-4d18-b128-cae77f1d751d>

4. Trajan
- Prototype: RIC II Trajan 121 (uncertain), minted 103–111, Rome mint
- Cast, flat surfaces, pierced at the edge
- TLDA inv. no. 5574/04; TLDA lab. no. 64/09
- Lead bronze, weight: 2.10 g
- <http://hdl.handle.net/428894.vzg/bc416e34-da66-46e9-8a3c-36b3d1be9511>

5. Hadrian for Caesar Antoninus Pius
- Prototype: RIC II, pt 3 (2nd edn) Hadrian 2764[55] (uncertain), minted 138, Rome mint
- Cast, flat surfaces
- TLDA inv. no. 8970/04; TLDA lab. no. 12/05
- Lead bronze, weight: 2.47 g
- <http://hdl.handle.net/428894.vzg/9df7d606-3446-413e-b7eb-0c559d0b53f9>

6. Antoninus Pius
- Prototype: RIC III Antoninus Pius 73c, minted 140–143; Rome mint.
- Plated, silver sheath blistered on obverse
- TLDA inv. no. 2810/05, TLDA lab. no. 68/09
- Silver plating, core: unknown; weight: 3.04 g; density: 8.46 g/cm³.
- <http://hdl.handle.net/428894.vzg/1493d8c6-4310-4a71-9838-5c0fbaa4bd5c>

7. Antoninus Pius
- Prototype: RIC III Antoninus Pius 111B, minted 143–144, Rome mint.
- Plated
- TLDA inv. no. 13/323–54; TLDA lab. no. 339/22
- Silver plating, core unknown; weight: 2.61 g; density: 8.69 g/cm³.
- <https://hdl.handle.net/428894.vzg/f8192d6b-b8dc-49e2-896f-33eac9e46a19>

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[54] In an excerpt from the analysis report of 7 December 2022 Dr Mecking writes: 'Die Dichte der Münze betrug 8.89 g/cm³. Auch beim Map ergab sich eine Stelle, an der kein Silber nachzuweisen ist. Deswegen besteht der Verdacht eines Kupferkerns' (The map also revealed a place where no silver can be detected. There is therefore a suspicion of a copper core.)

[55] In Schwinghammer (2000, slide 24) given as RIC II Hadrian 447A (= RIC II, pt 3 (2nd edn) Hadrian 2728), but the reverse legend seems to end in …II.

8. Antoninus Pius

- Prototype: possibly RIC III Antoninus Pius 249, minted 155–156, Rome mint
- Barbarous
- TLDA inv. no. 5522/01, TLDA lab. no. 51/09
- Silver, weight: 2.42 g
- <http://hdl.handle.net/428894.vzg/3df947ab-b736-4419-b6d2-5c0576775321>

9. Antoninus Pius

- Prototype: RIC III Antoninus Pius 252, minted 155–156, Rome mint
- Plated, silver sheath partly pierced
- TLDA inv. no. 5605/04, TLDA lab. no. 62/09
- Silver plating, core: unknown; weight: 2.85 g; density: 8.99 g/cm^3.
- <http://hdl.handle.net/428894.vzg/e17e62b5-38ea-46f0-8253-02d0eebe4f4d>

10. Antoninus Pius for Diva Faustina I

- Prototype: RIC III Antoninus Pius 346B, minted from 141 (until 161?), Rome mint.
- plated
- TLDA inv. no. 2809/05; TLDA lab. no. 341/22
- Silver plating, core: copper; weight: 2.36 g; density: 8.33 g/cm^3.
- <http://hdl.handle.net/428894.vzg/f19ac754-face-437b-8f74-176abd21e49f>

11. Antoninus Pius for Diva Faustina I

- Prototype: RIC III Antoninus Pius 351a, minted from 141 (until 161?), Rome mint.
- cast
- TLDA inv. no. 1530/02, TLDA lab. no. 53/09
- Lead bronze, weight: 2.85 g
- <http://hdl.handle.net/428894.vzg/c083e4c0-19fa-4df0-a589-8b26ea6fb138>

12. Antoninus Pius for Diva Faustina I

- Prototype: RIC III Antoninus Pius 351a,[56] minted from 141 (until 161?), Rome mint.
- plated
- TLDA inv. no. 8971/04, TLDA lab. no. 350/22
- Silver plating, core: copper; weight: 2.56 g; density: 8.31 g/cm^3.
- <https://hdl.handle.net/428894.vzg/cead2e82-63ba-43fe-96d1-6526c8a6a6bf>

13. Antoninus Pius for Diva Faustina I

- Prototype: RIC III Antoninus Pius 378a, minted from 141 (until 161?), Rome mint.
- cast
- TLDA inv. no. 1533/02, TLDA lab. no. 54/09
- Tin bronze, weight: 2.67 g
- <http://hdl.handle.net/428894.vzg/7c23a810-37be-4769-9819-2f7d7b0bc150>

14. Antoninus Pius or Marcus Aurelius for Faustina II

- Prototype: hybrid: obverse cf. RIC III Antoninus Pius 495A (as first possible number) minted 145–161, Rome mint, reverse RIC Antoninus Pius 515–516; minted 145–176, Rome mint; possibly also RIC III Marcus Aurelius 728[57] (minted 161–176, Rome mint)
- Barbarous
- TLDA inv. no. 2900/04; TLDA lab. no. 60/09
- Silver, weight: 2.15 g
- <http://hdl.handle.net/428894.vzg/32a8db05-8d25-4985-a188-015d122471ba>

15. Marcus Aurelius

- Prototype: RIC III Marcus Aurelius 209, minted 168–169, Rome mint.
- Cast[58]
- TLDA inv. no. 5578/04, TLDA lab. no. 65/09
- Tin bronze; weight: 2.75 g
- <http://hdl.handle.net/428894.vzg/f25e2224-8e1f-41ac-92db-6a9935697715>

16. Marcus Aurelius

- Prototype: RIC III Marcus Aurelius 209 (uncertain), minted 168–169, Rome mint
- Cast (miscast?)
- TLDA inv. no. 8909/04
- Silver; weight: 2.55 g
- <http://hdl.handle.net/428894.vzg/08210903-ad21-4b67-943c-38dd6ae71353>

17. Marcus Aurelius for Faustina II.

- Prototype: RIC III Marcus Aurelius 676, minted 161–176, Rome mint.
- Cast,[59] pierced
- TLDA inv. no. 2666/02, TLDA lab. no. 55/09
- Silver, weight: 2.95 g
- <http://hdl.handle.net/428894.vzg/37e1f2b8-6a97-449c-8604-b4e6a2cebc84>

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[56] Identical in type to the cast coin cat. no. 11, but there is clearly no die-link.

[57] Possible overall model for the coin (deviation reverse: rudder instead of sceptre).

[58] I would like to thank Dr Wigg-Wolf, Frankfurt am Main, for information on the question of whether the cast coin was barbarous or, in this case, rather not.

[59] I would like to thank Dr Wigg-Wolf, Frankfurt am Main, for information on the question of whether the cast coin was barbarous or, in this case, rather not.

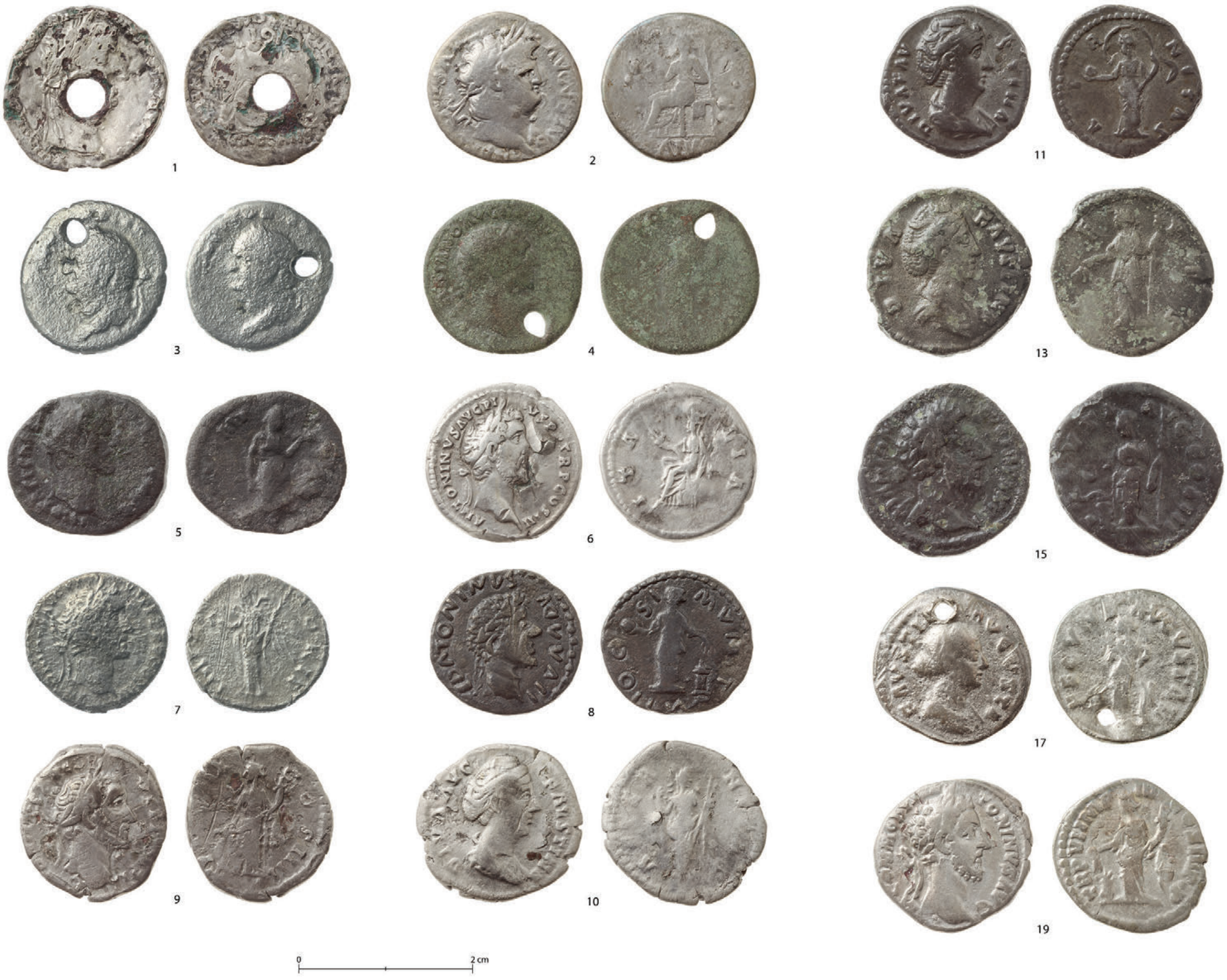
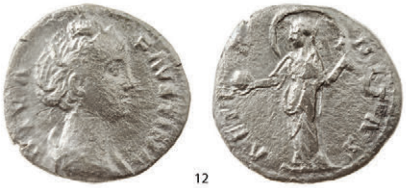
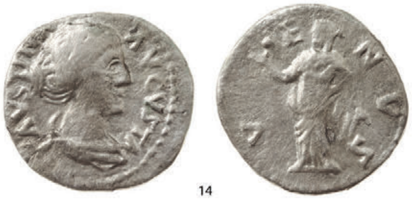

1
2
11
3
4
13
5
6
15
7
8
17
9
10
19
0
2 cm

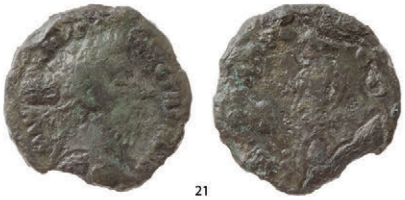
Figure 4.3. Plate with twenty-six imitative denarii (copyright: author, coin images: Mario Schlapke, TLDA Weimar: Kat. 3, 7; Roland Wehking, Oldenburg (Oldb): other images).



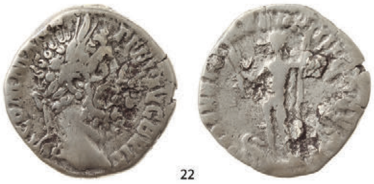
12



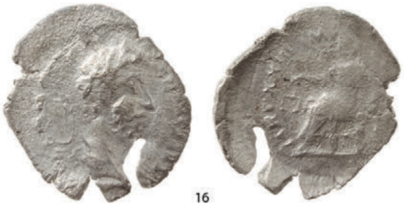
14



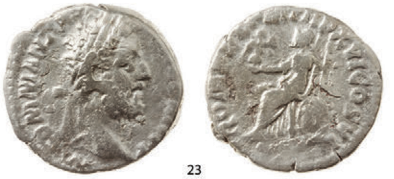
21



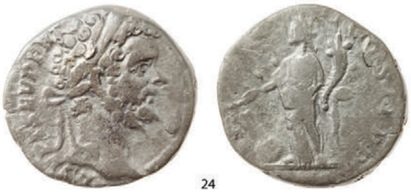
22



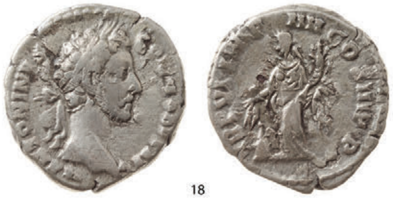
16



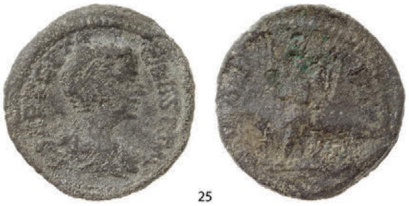
23



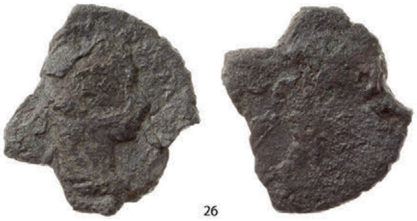
24



18



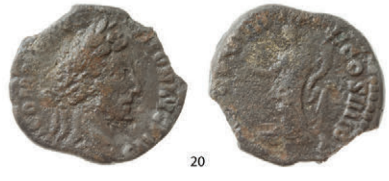
25



26

0

2 cm



20

18. Commodus
- Prototype: RIC III Commodus 14b, minted 181, Rome mint
- Plated
- TLDA inv. no. 4319/01, TLDA lab. no. 50/09
- Silver plating, core: unknown; weight: 2.69 g; density: 8.65 g/cm³.
- <http://hdl.handle.net/428894.vzg/c2c96809-b9f3-4b25-b681-2ac92877c41b>

19. Commodus
- Prototype: RIC III Commodus 28, minted 181–182; Rome mint
- Plated
- TLDA inv. no. 3963/02, TLDA lab. no. 340/22
- Silver plating, core: unknown, weight: 2.71 g; density: 8.62 g/cm³.
- <http://hdl.handle.net/428894.vzg/54045a8d-ad2b-4614-a424-4970c62688c3>

20. Commodus
- Prototype: RIC III Commodus 73 (uncertain), minted: 183–184, Rome mint
- Cast
- TLDA inv. no. 2883/04, TLDA lab. no. 57/09
- Tin bronze, weight: 2.07 g
- <http://hdl.handle.net/428894.vzg/61735c1e-c88f-43af-90e0-4a671696724f>

21. Commodus
- Prototype: RIC III Commodus 120[60] (probably), minted 185, Rome mint
- cast
- TLDA inv. no. 5573/04, TLDA lab. no. 63/09
- Tin bronze, weight: 2.28 g
- <http://hdl.handle.net/428894.vzg/8039c775-01b5-410d-b898-3729cc07a96d>

22. Commodus
- Prototype: RIC III Commodus 175, minted 188–189, Rome mint
- Plated, silver sheath partly broken open
- TLDA inv. no. 5565/04, TLDA lab. no. 61/09
- Silver plating, core: unknown; weight: 2.41 g; density: 8.72 g/cm³.
- <http://hdl.handle.net/428894.vzg/922c1104-f01a-402f-8825-76124a9cbee7>

23. Commodus
- Prototype: RIC III Commodus 224, minted 190, Rome mint
- Plated
- TLDA inv. no. 2672/02; TLDA lab. no. 343/22
- Silver plating, core: copper; weight: 2.41 g; density: 8.40 g/cm³.
- <http://hdl.handle.net/428894.vzg/537d33ea-8770-4d4c-9f6e-f3c4a288f4b5>

24. Septimius Severus
- Prototype: RIC IV.1 Septimius Severus 68 or 71 or 84 or 104 or 115A or 493, minted 195–198, Rome mint or Laodicea ad Mare mint
- Plated
- TLDA inv. no. 2884/04, TLDA lab. no. 58/09
- silver plating, core: unknown; weight: 2.93 g, density: 8.58 g/cm³.
- <http://hdl.handle.net/428894.vzg/efc03ede-0f6d-4b07-ab8e-a37943869611>

25. Septimus Severus for Geta
- Prototype: RIC IV.1 Geta 13A, minted 200–202; Rome mint
- Cast
- TLDA inv. no. 4983/00, TLDA lab. no. 49/09
- Tin bronze, weight: 2.01 g
- <http://hdl.handle.net/428894.vzg/ad64e40c-ca43-487b-8b0c-4932fd788aec>

26. Severus Alexander
- Prototype: RIC IV.2 Severus Alexander 25, minted 223, mint of Rome
- Plated, on reverse proof mark, badly preserved ('burnt'?)
- TLDA inv. no. 8864/04, TLDA lab. no. 66/09
- Former (silver?) plating no longer present, core: copper; weight: 2.33 g
- <http://hdl.handle.net/428894.vzg/b1e78110-14ab-4b10-9878-9b90bdb15e90>

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[60] Assignment via possible verse M COMM ANT AVG P FEL AVG BRIT.

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ARKADIUSZ DYMOWSKI

5. The ONAV Group of Barbarian Imitations and Copies of Roman Imperial Coins

Manufacturing of denarii subaerati *in Eastern Europe in Antiquity*

ABSTRACT Several groups of barbarian imitations of Roman denarii including between a dozen-odd and over a hundred types have been analysed and published recently. Attribution to individual groups is based on die-links. The text presented here is the first detailed discussion of the largest of these groups — the ONAV Group. It includes imitations and copies of Roman denarii of the second–third centuries (mostly subaerati, some without evidence of barbarization of their designs, and a few struck in silver), a gold imitation of an aureus of the second century, and gold and gilded imitations of aurei from the turn of the third century. Nearly all of the coins assigned to this group were discovered in Ukraine or Moldova. The geographic distribution of the ONAV Group coins suggests they were manufactured in a workshop located in the western part of Ukraine. The latest Roman prototypes for the imitations (late aurei) date the time of the operation of this workshop to the turn of the third century at the earliest. The ONAV Group is of major scholarly interest because it offers insight into the connection between the manufacture in Eastern Europe of imitations (and copies) of imperial denarii (in silver, and subaerati) and aurei (gold, or gilded) from the period of the Nerva–Antonine dynasty but also of the Tetrarchy, and shows that barbarians knew how to make counterfeit Roman denarii (*denarii subaerati*) without subjecting them to barbarization.

KEYWORDS Barbaricum, Roman coins, coin finds, coin hoards, counterfeit coins, *denarii subaerati*, plated denarii, fourrées, imitations of Roman coins

When approximately two decades back Karlhorst Stribrny (2003, 51–67) was publishing his study on barbarian imitations of Roman denarii and identified a group of die-linked coins which apparently belonged to a die-chain little did he suspect the existence of many more similar chains, much larger than his SALVS AVGVSTI Group. Since then, several such groups have been analysed and published: Hulterstad-Uggårda Group (Lind 2007, 54; 2020, 68–71), CERES Group (Dymowski 2019a, 179–89), VENVS VICTRIX Group (Dymowski 2019b, 157), NNN Group (Myzgin and others 2020, 366–69). At least a few more wait to be picked out from the pool of coin types not attributed as yet to any of the known die-links and subjected to analysis.[1] This is the effect of a major increase of the pool of coin finds, mostly from the territory of the archaeological Chernyakhiv culture which developed on the territory of Ukraine and Moldova (see Anokhin 2015, 34–204; 2019). The distribution of find-spots identifies this

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[1] Many die-links, often forming part of larger chains, some of which have not been analysed in detail, were identified and published by Oleh Anokhin in his catalogues of barbarian imitations discovered in Ukraine and Moldova (Anokhin 2015; 2019). One chain analysed largely on the basis of this Ukrainian numismatist is the NNN Group mentioned here.

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particular region as the main centre of production of barbarian imitations of Roman imperial coins east of the Rhine and north of the Danube limes. The pool of these coin finds suggests large-scale manufacture by barbarian craftsmen of imitations and copies[2] of silver coins, primarily Roman imperial denarii, issues of the Nerva–Antonine dynasty in particular. Some of these imitations and copies are subaerati. Gold coins were also imitated, mostly using second- and third-century aurei as prototypes (for a more extensive discussion of barbarian imitations of silver and gold coins see Dymowski and Myzgin 2024, in press; Więcek and Myzgin 2024, in press). The Chernyakhiv culture, which is central for understanding the phenomena related to the manufacture of imitations and copies in the Eastern European Barbaricum, has been identified with an ethnically mixed population dominated by the Goths. The origins of this archaeological culture, and as such, the earliest possible beginning of the phenomena described here must be dated to the middle of the third century (see contribution by K. Myzgin in this volume).

The ONAV Group to be discussed here is definitely the largest die-chain of barbarian imitations and copies of denarii, and imitations of Roman aurei recorded to date. It was identified and described in a preliminary manner by the Ukrainian numismatist Oleg Anokhin (2015, 6, 21; 2018) first in the introduction to his catalogue of Roman coin imitations found in Ukraine and Moldova published in 2015, next in a separate article published in 2018. O. Anokhin (2018, 37) did not name the group he had identified but noted the importance of a piece-punch with the inscription ONAV for the analysis and description of the die-chain. Based on this Kyrylo Myzgin and I named the chain the ONAV Group. For the first time, in a text submitted for publication in 2019 (Dymowski and Myzgin 2024, in press), and subsequently in several consecutive publications (Dymowski 2020, 171–72; Myzgin and others 2020, 366–68; Dymowski 2021, 113–14). So far nearly all the coins attributed to the ONAV Group are finds from Ukraine and Moldova (Anokhin 2018, 36). The only specimen from outside this region was attributed to a hoard discovered at Iezer, in eastern Romania (Munteanu and Popușoi 2015, 22).[3] The geographic distribution of the coin finds attributed to the ONAV Group (see Map 5.1) suggests their manufacture in a workshop located in the western part of Ukraine then within the range of the Chernyakhiv culture. This, provided that the coins in the ONAV Group all originate in the same workshop, and this is not entirely certain. For it is possible that some of the coins described as made from the same die (or a pair of dies) are in fact imitations (or copies) made with dies reproduced mechanically from dies used to strike the 'original' coins in the ONAV Group, that is, by hubbing. In which case we would be dealing with imitations (or copies?) of imitations/copies (see Dymowski 2020, 172).

In writing the present article I made a study of 205 coins in the ONAV Group[4] (I had direct access to fourteen specimens now in a private collection in Poland, for the remainder I had to rely on photographic images, where available, with a larger or a smaller number of details). In June 2022, the ONAV Group included 183 coin types,[5] defined unique combinations of the obverse and reverse die (see Catalogue Part I). Two coins sharing the same obverse and reverse die but struck in different metals (one of them is a *denarius subaeratus*, the other a gold coin) are treated by me as two separate types (similarly as O. Anokhin), the only such case identified so far (Types 8 and 9). The 183 types were struck from seventy-one obverse and fifty-eight reverse dies (e.g. Obv. die 10a, and Rev. die 34a in the Catalogue). Some dies have variants (e.g. Rev. die 1a, 1b, 1c) which could be the result of touching up of a die, or the use of the same hub or the same piece-punches to strike different dies; the latter ranged from minor design elements to nearly complete designs, e.g. the complete imperial portrait. The latter option is suggested by the minor differences between the variants which have nearly the same or identical designs with at the same time major differences in the legend. Next to links between dies I identified links

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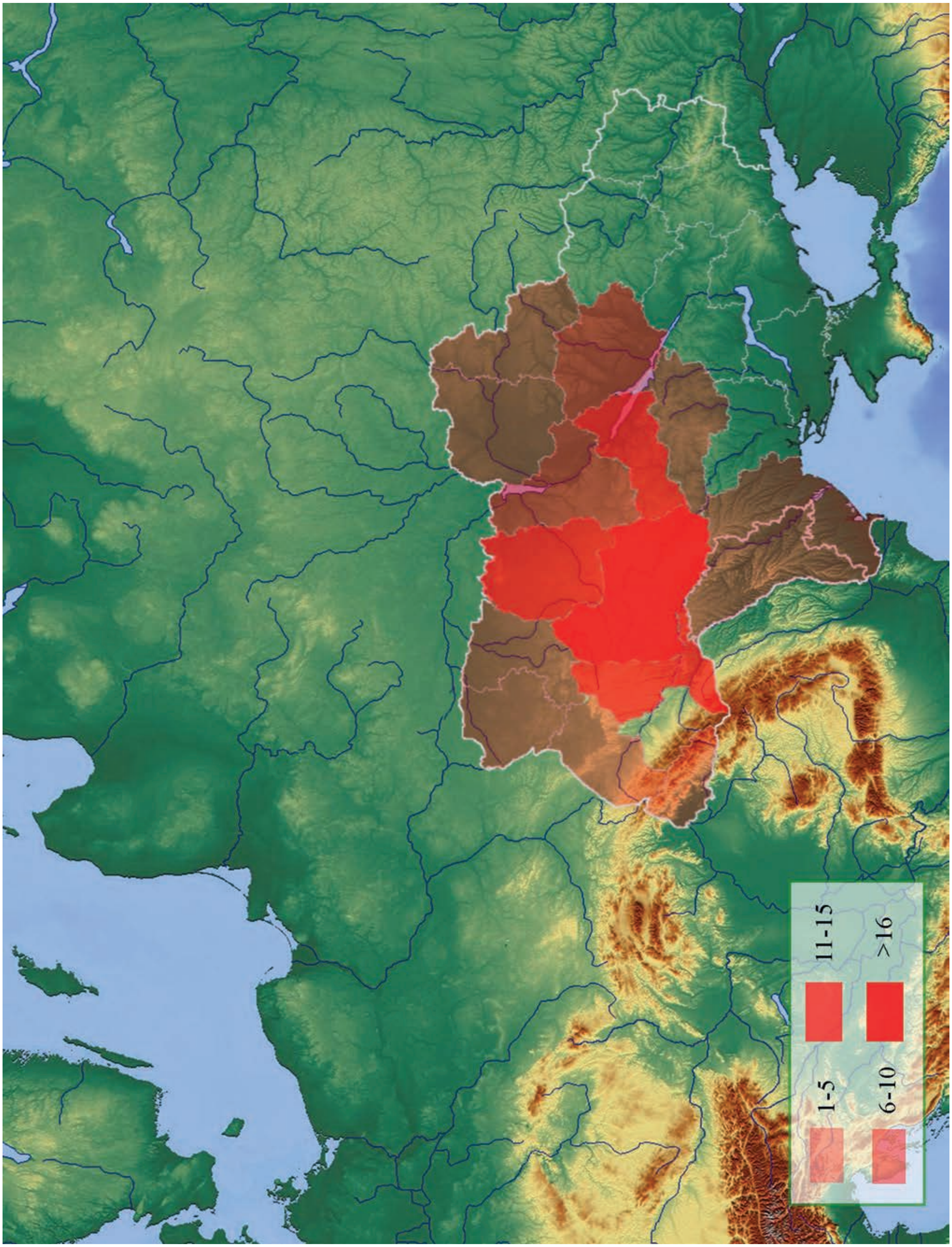
[2] The images on the coins from barbarian workshops were either made to differ (barbarized) from the official coin types, or are their relatively faithful reproductions. The first group are referred to as imitations, the second as copies. More extensively on this subject see Dymowski 2021, 113.

[3] According to a personal communication from Cristian Găzdac the assemblage described in this publication mostly comprises coins discovered outside hoards.

[4] The materials assembled in the course of this study are in the Catalogue below this article. I only had indirect access to most of these coins. They include 185 specimens published by Oleg Anokhin (incl. four specimens, i.e. two pairs of coins described by Anokhin as four separate types when in reality they are two pairs of the same two types; eight coins put up for auction (incl. three specimens that are identical to those published by Anokhin) and the coin from Iezer. In his catalogues Oleg Anokhin (2015; 2019) included only individual specimens attributed by him to a specific type. Consequently, these publications do not extend to other coins from the ONAV Group representing the same types, recorded by Anokhin but mostly unpublished. These unpublished coins could be studied only from their photographic images, without any descriptive data.

[5] The type numbers indicated in the text correspond to the type numbers described and illustrated in the first part of the Catalogue published in this article. This applies also to numbers of obverse and reverse die number (Obv. die and Rev. die, respectively).



Map 5.1. ONAV Group coins — geographic distribution (according to O. Anokhin 2018, 36; drawing K. Myzgin).

between part designs from individual piece-punches used to strike the dies. Four such piece-punches were distinguished (see Catalogue Part II), one of them with a group of letters — ONAV — presumably a fragment of the obverse legend of a coin of Commodus (M COMMODVS ANTON AVG PIVS, or similar). Thus, what the ONAV Group has to offer is not only a chain of links between dies, but in fact, a chain of links between dies and piece-punches (or part designs sunk from piece-punches into dies). The dies were made either using the method of the mechanical reproduction (transfer) of designs from original coins (see Stribrny 2003, 62–66; Stannard 2011, 73), or engraved by hand. Some dies were made using both these methods — the images transferred mechanically onto the die were touched up and completed by hand engraving or impressed from piece-punches (these were probably made by mechanically transferring a fragment of a design from the original coins — every time, a fragment of the legend). In these ways copies of Roman coins were obtained, their original design largely intact, not barbarized (e.g. Type 18), heavily barbarized imitations (e.g. Type 138) but also imitations showing only a low level of barbarization (e.g. Type 11). When the dies were selected to strike a coin no attention was paid to the degree of barbarization of the designs, thus in some coins the obverse and the reverse differ substantially in this respect (e.g. Type 104). As a matter of fact in general the selection of dies used to make a coin in the workshop which produced specimens of the ONAV Group was apparently random, this is suggested by many obverse-reverse and reverse-obverse die combinations. This shows that several different obverse and reverse dies were in use during the same period. But despite this haphazard approach we can indicate two patterns. First, all the coins are from a pair of dies where the obverse is a portrait of the regnant emperor or his family member, and the reverse has a design that is analogical to the reverses of the original Roman coins. Second, not a single imitative denarius in our group was struck from the obverse die modelled on a late Roman aureus from the turn of the third century. On the other hand, a number of gold or gilded coins were struck from the obverse and/or reverse dies with a design that is typical of earlier denarii (and aurei), but this is discussed at greater length below.

But first we need to review the denominations represented by the imitations and copies in the ONAV Group, their material, and their prototypes. The vast majority of coin types and coins themselves are imitations and copies of denarii (Types 9–183) which have as their prototypes second-century denarii (spanning Hadrian and Commodus), only exceptionally the prototype was identified tentatively as a third-century denarius, antoninianus, or aureus.[6] Out of sixty-seven obverse dies (not counting the variants) used to strike the denarii in the ONAV Group only four represent women from the imperial family. The standard obverse design is a portrait of a bearded emperor.

Most of the denarii in this group are subaerati (the material of ONAV Group coins — the little that we know — is presented in Tables 5.1, 5.2, and in Part III of the Catalogue). We had no way to examine the material of these coins to identify any of them securely as a subaeratus or a specimen made entirely of silver of other metal. Of the fourteen denarii to which I had direct access no less than thirteen are evidently subaerati, and one was probably made from a uniform, apparently silver blank. These are not 'classic' *denarii subaerati*, that is, coins struck on blanks prepared by plating a copper or a copper alloy core with a relatively thick layer of silver. The subaerati in the ONAV Group are coins covered with a thin silver coating, applied presumably after the coin was struck on a blank made of base metal, apparently copper alloy. O. Anokhin (2019) gives information about the material of 168 denarii in the ONAV Group: except for four specimens struck on silver, the rest (164) were 'silvered bronze'. To judge by the photographs published by O. Anokhin two coins that he described as made of silver are in fact subaerati. On the other hand, three denarii put up for auction by the Warsaw Numismatic Centre (Warszawskie Centrum Numizmatyczne, WCN) are evidently identical with the coins published by O. Anokhin. The material of two denarii (Type 86; Anokhin 2019, no. 478 Ag and Type 22; Anokhin 2019, no. 591 Ag) was described by O. Anokhin and WCN in the same way. But they disagreed as to the material of the third denarius (Type 38; Anokhin 2019, no. 1010 Ag): according to WCN this is a silver coin, while according to O. Anokhin it is silvered bronze. The fourth coin put up for auction by WCN, not included by O. Anokhin, was described as made of silver. Additionally, the offer of another auction house, Savoca Numismatik, included three coins from the ONAV Group, all of them described as subaerati (fourrées). The coin from Iezer is also a subaeratus.

Anokhin (2019) recorded the weight of ninety-four denarii. Eight denarii in the ONAV Group have been put up for auction by WCN or by Savoca Numismatik. The weight of these coins also is known, but we have to note that two of them are definitely the same specimens for which the weight (different from the one given by the auction houses) was recorded also by O. Anokhin.[7] I weighed fourteen coins myself, while the weight of the coin attributed to the Iezer hoard was given in a publication of this assemblage (Munteanu and Popușoi 2015, 22; for all the available weights see Tables 5.1, 5.2, and Catalogue Part III). For the fourteen coins weighed by me the average and the median values are 2.34 g and 2.40 g respectively. For the fourteen coins weighed by me, eight coins put up for auction, and the coin from Iezer the analogous values are 2.28 g and 2.32 g. If we add to this pool ninety-four weights recorded by O. Anokhin (aware that by doing so we have doubled in our calculations the weight of two coins which have their value given differently by O. Anokhin and WCN), we obtain an average of 2.29 g and a median of 2.32 g. As may be seen, all these values are similar. They are slightly lower than the average weights recorded for official denarii found in Eastern European hoard finds (see e.g. Myzgin and others 2020, 364) and for barbarian imitations of Roman denarii made of silver (see e.g. Stribrny 2003, 21–49; Dymowski 2019a, 185). Out of 197 denarii (177 recorded by O. Anokhin, five put up by the auction houses, not published previously by O. Anokhin, fourteen examined by me, and the Iezer coin) only nine subaerati have a hole. This shows that the (secondary?) use of subaerati from the ONAV Group as ornaments was sporadic.

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[6] Rev. die 1 (in variants 1a, 1b, and 1c) was probably modelled on the reverse of a third-century denarius, antoninianus, or aureus, the type with Apollo seated left, holding olive branch and lyre, while the prototype for the Obv. die 52a was presumably the obverse of a denarius of Severus Alexander.

As noted earlier, as well as the denarii the ONAV Group includes imitation aurei. They were not the primary focus of the research presented here and elsewhere in this volume. The number of the recorded aurei and their types being much smaller than that of the denarii and their types the former will be discussed much more briefly. Two coins were described by O. Anokhin as made of gold. Both had been pierced. The first specimen (Type 8), wt. 2.98 g, was struck from dies modelled on the obverse type of an aureus or denarius of Commodus, and on the reverse type of an aureus or denarius of Lucius Verus (RIC 460–66). The same pair of dies was used to strike a *denarius subaeratus* (Type 9), and we also identified more links between the obverse and the reverse dies with other denarii types in our group. The second specimen (Type 1), is much heavier, wt. 5.6 g, and was struck from an obverse die modelled on the obverse type of a coin (aureus?) of one of the Tetrarchs from the final years of the third century, or possibly, the first years of the fourth. This is the latest prototype of those currently identified for imitations and copies in the ONAV Group. On the other hand, the likely prototype for the reverse of this coin was the reverse of a third-century denarius, antoninianus, or aureus, type with Apollo seated left, holding olive branch and lyre. Three further coins (Types 2, 3, 4) have the obverse and the reverse modelled on an aureus of Maximian issued in 290–292 (RIC 597 or 610). According to the description given by O. Anokhin two of these specimens, each weighing 5.6 g, were made of gilded bronze, for the third we have no data about its weight or material; one of these coins had been pierced, two retain traces of a loop attachment. Finally, three aurei (Types 5, 6, 7) represent the more heavily barbarized variants of imitations modelled presumably on the same aureus of Maximian, except that the reverse of one of them (Type 6) has a reverse struck from a die modelled on an aureus, or a denarius, of Commodus. According to the description of O. Anokhin two of these coins are made of gilded bronze (wt. 3.69 g and 5.17 g), and one of lead (wt. 4.1 g); one specimen has two holes (one of them breached), one is fitted with a loop, and the third (allegedly made of lead) retains traces of a loop attachment. All of the imitation aurei in the ONAV Group have instantly recognizable close analogies among a large number of gold or gilded barbarian imitations of Roman coins assigned to the Eastern European Group (Myzgin and others 2018, 224–32; Buhay and Myzgin 2021, 41–42; Więcek and Myzgin 2024, in press). As a rule they have either a hole or a loop (Anokhin 2015, 34–69; Myzgin and others 2018, 227; Więcek and Myzgin 2024, in press). The researchers interested in imitative coins of this type mostly agree that that they were used by the barbarians (presumably, even made for the express purpose) as jewellery, dress objects, and not as money.

In summary, to date we have attributed to the ONAV Group imitations and copies of second–third-century denarii (most of them subaerati, a few struck on silver), a gold imitation of an aureus of the second century, and gold and gilded imitations of aurei from the turn of the third century. The ONAV Group is of major scholarly interest because it offers insight into the connection between the manufacture in Eastern Europe of imitations (and copies) of imperial denarii (in silver, and subaerati) and aurei (gold, or gilded) from the period of the Nerva–Antonine dynasty but also of the Tetrarchy, and shows that barbarians knew how to make counterfeit Roman denarii (*denarii subaerati*) without subjecting them to barbarization. At the same time, the presence in the ONAV Group of imitations of coins from the period of the Tetrarchy allows for a late dating (in the case of the ONAV Group, not earlier than the turn of the third century) of the production of imitations and copies of denarii (subaerati included), and imitations of aurei modelled on issues of Antonine emperors, at least, by the ONAV Group workshop. The closest analogy for the ONAV Group is the NNN Group. The die-chain of the NNN Group, much smaller than the one constructed for the ONAV Group, includes besides imitations of denarii of the first to second (or third?) centuries a gold imitation of an aureus with an obverse modelled on a type of Domitian, and the reverse on a second- or third-century coin. In addition, at least one of the imitative denarii attributed to the NNN Group is a subaeratus while another, subjected to metallographic analysis, was definitely struck in silver (Myzgin and others 2020, 366–69, 378, 383).

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[7] Denarius, Type 86: according to O. Anokhin (2019, no. 478 Ag) 2.4 g, according to the description of the coin put up for auction of the Warsaw Numismatic Centre — 2.32 g. Denarius, Type 22: according to O. Anokhin (2019, no. 591 Ag) 3.1 g, according to the description of the coin put up for auction of the Warsaw Numismatic Centre — 2.86 g.

The next issue to be addressed is the broader context of the production of *denarii subaerati* in a hypothetical workshop, the source of coins of the ONAV Group located in western Ukraine. This is the only case identified in the Barbaricum of a production of imperial *denarii subaerati* without barbarized images. Thanks to this we know that not all of the *denarii subaerati* discovered in the Barbaricum not instantly recognized as barbarian imitations were necessarily imported from the Empire. At least some of them are local products. The geographic spread of finds of the subaerati from the ONAV Group (see Map 5.1) proves that they were distributed across a vast territory of the Chernyakhiv culture. Could the denarii subaerati produced there have found their way to other regions of the Barbaricum as well? They could have, given the redistribution, confirmed for the full-value denarii struck in silver by die-links between specimens found in regions often separated by a great distance, in very Northern, Central, and Eastern European parts of the Barbaricum, between the Great Hungarian Plain and Scandinavia, between present-day Germany and Ukraine (Lind 1993, 139–40; Bursche 1994, 472–75; Bursche 2004, 198; Horsnæs 2013, 85; Dymowski and Myzgin 2014, 49–56; Rudnicki 2017, 52–53; Dymowski 2019a, 186). What is more, Roman imperial denarii, especially their first- and second-century issues were used by the barbarians for a very long time, until the Migration period, at least until the turn of the fifth century (Bursche 2005, 203–05). Outside Ukraine and Moldova finds of *denarii subaerati* have been recorded in the Central European part of the Barbaricum, with an especially large number in Poland. This is in contrast to the Baltic islands (Bornholm, Gotland, Öland) and the Scandinavian Peninsula (Dymowski 2020, 168–70; forthcoming — with a list of references) where their finds are rare or completely unknown. Perhaps some of these subaerati come from Chernyakhiv workshops, or perhaps, from some other as yet unidentified workshops possibly located in other parts of the Barbaricum. Given the extended period these denarii continued in use among the barbarians these workshops may have been in business later than around the turn of the third century indicated for the ONAV Group.

For what purpose were these subaerati manufactured by the barbarians? Well, in my view they were produced as counterfeits, for profit, to cheat the barbarian users. And were treated as such by these users when they found that these coins were not entirely made of silver (Dymowski 2020, 172–74; cf. Crawford 1968, 55–59; Peter 2011, 115–17). Consequently, the production of *denarii subaerati* by barbarians — similar to the production of the base metal *denarii flati* evidenced in western Ukraine (see the contributions by Myzgin, and by Nadvirnyak and Pohorilets in this volume) — must be examined as part of the broader phenomenon of the manufacture and use of Roman imperial denarii counterfeits within the Barbaricum. Developing the arguments put forward some time ago by Aleksander Bursche (2004, 200–02; 2008, 397–407), and reiterating the line of reasoning presented in one of my earlier publications (Dymowski 2020, 173–74), let me note that denarii discovered on the territory of the Barbaricum in hoards, thus in a context which suggests their status as a standard of value, are — as a rule — full-value coins, not infrequently found together with other precious metal objects. Subaerati and other counterfeit denarii tend to occur outside hoards, presumably because they were used for purposes other than as a standard of value. In other words, if a full-value silver coin was treated as a standard of value within a sphere of use (in this case, hoarding) reflected by hoard finds, the production and use of the subaerati (treated as counterfeits) suggest that barbarians were using denarii also as a medium of payment and/or means of exchange within another sphere of use — as part of a phenomenon resembling circulation. This is supported by many full-value denarii found in association with counterfeits in barbarian settlements dated to the Roman period — certainly, in Central Europe, and very likely, in Eastern Europe too (but our information about settlement finds of coins in the latter area is limited, not enough to warrant any authoritative statements). This is hard to explain unless we assume that denarii were in common use, obviously in larger transactions considering the substantial value of a single denarius.

Finally, a question worth considering is how the idea of making subaerati and the necessary technology had passed to the Eastern European region of the Barbaricum. A more extensive discussion of this problem is given in my joint publication with Bartosz Awianowicz and Kyrylo Myzgin (Awianowicz and others 2022, with a list of references), here let me cite only the key conclusions concerning the plated denarii. The idea may have been borrowed in the Roman provinces raided and infiltrated by the barbarians, or it was introduced with the wares of Roman fakers brought to the Barbaricum. Unless of course the barbarians, like other users of coinage across the world, came up with the idea on their own independently of phenomena at work within the Empire. In any case, the technique of the production of the subaerati itself was known in Barbaricum in an earlier age. For instance, some of the Dacian imitations of Roman republican denarii dated to the period prior to the Roman conquest in the early second century AD are subaerati. Thus, the barbarians had relatively easy access to the idea of and the technology for the production of the subaerati. The importance of the discovery that subaerati, or more broadly, counterfeit denarii were manufactured by the barbarians of Eastern Europe during the Roman period lies in the observation that they were using Roman silver coins as a medium of payment and/or means of exchange. Thus in terms of the use of money they were on a higher level of socio-economic development than we used to think.

Translated by Anna Kinecka

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Table 5.1. Data recorded by O. Anokhin (coins from Ukrainian and Moldavian finds; according to <https://barbarous-imitations.narod.ru> [accessed 4 July 2024]; the data concern specimens published on this site).

Coin type (within the ONAV Group)	Anokhin no.	Weight (g)	Diameter (mm)	Remarks
1	115 Au	5.6	21	gold, pierced
2	72 Au	5.6	-	gilded bronze, looped (?)
4	373 Au	5.6	-	gilded bronze, pierced
5	523 Ag	4.1	-	lead
6	312 Au	3.69	-	gilded bronze, looped
7	252 Au	5.17		gilded silver, pierced
8	361 Au	2.98		plated bronze
9	1099 Ag	2.38		gold, pierced
10	208 Ag	2.58	-	plated bronze
11	238 Ag	-	-	plated bronze
12	782 Ag	-	-	plated bronze
13	1149 Ag	1.34	-	plated bronze
14	195 Ag	2.25	-	plated bronze
15	190 Ag	2.25	-	plated bronze
16	194 Ag	-	-	plated bronze
17	17 Ag	-	-	plated bronze
19	18 Ag	-	-	plated bronze
20	25 Ag	-	-	plated bronze
21	440 Ag	2.7	-	plated bronze
22	591 Ag	3.1	-	plated bronze
23	51 Ag	2.2	-	plated bronze
24	1297 Ag	2.36	-	plated bronze
25	53 Ag	2.08	-	plated bronze
27	84 Ag	-	-	plated bronze
28	193 Ag	-	-	plated bronze
29	118 Ag	-	16	plated bronze
30	1060 Ag	-	-	plated bronze, pierced
31	134 Ag	1.81	-	described as silver, certain subaeratus according to the photographs, pierced
32	429 Ag	1.85	-	plated bronze
33	152 Ag	1.93	-	plated bronze
34	1163 Ag	-	-	plated bronze
35	181 Ag	-	-	plated bronze
36	1351 Ag	2.91		plated bronze
37	513 Ag	-	-	plated bronze
38	1010 Ag	-	-	plated bronze
39	864 Ag	2.84	-	plated bronze
40	187 Ag	2.23	-	plated bronze
41	506 Ag	-	-	plated bronze
42	752 Ag	-	-	plated bronze
43	1533 Ag	2.28	-	plated bronze

Coin type (within the ONAV Group)	Anokhin no.	Weight (g)	Diameter (mm)	Remarks
45	189 Ag	2.25	-	plated bronze
46	1501 Ag	1.67	-	plated bronze
47	375 Ag	1.82	-	plated bronze
48	1394 Ag	2.6	17	plated bronze
49	908 Ag	-	-	plated bronze
50	869 Ag	-	-	plated bronze
51	219 Ag	-	-	plated bronze
52	921 Ag	-	-	plated bronze, pierced
53	907 Ag	-	-	plated bronze
54	1042 Ag	-	-	plated bronze
55	1067 Ag	2.7	-	plated bronze
56	692 Ag	2.84	-	plated bronze
57	972 Ag	2.22	-	plated bronze
58	237 Ag	2.12	-	plated bronze
60	250 Ag	2.57	-	plated bronze
61	1126 Ag	-	-	plated bronze
62	1535 Ag	2.27	-	plated bronze
63	1404 Ag	2.47	-	plated bronze
64	282 Ag	2.5	-	plated bronze
66	311 Ag	-	-	plated bronze
67	326 Ag	-	-	plated bronze
68	343 Ag	2.31	-	described as silver, certain subaeratus according to the photographs
69	1246 Ag	2.26	-	plated bronze, pierced
70	602 Ag	2.4	-	plated bronze
71	1227 Ag	2.67	-	plated bronze
72	745 Ag	-	-	plated bronze
73	838 Ag	2.45	-	plated bronze
74	741 Ag	1.83	-	plated bronze
75	1412 Ag	-	-	plated bronze
76	346 Ag	1.66	-	plated bronze
77	445 Ag	2.48	-	plated bronze
79	688 Ag	2.51	-	plated bronze
80	460 Ag	-	-	plated bronze
80	1138 Ag	2.42	-	plated bronze
81	447 Ag	2.62	-	plated bronze
82	1192 Ag	2.42		plated bronze
83	457 Ag	2.1	-	plated bronze, pierced
85	1515 Ag	1.92	-	plated bronze, pierced
86	478 Ag	2.4	-	silver
87	526 Ag	-	-	plated bronze
88	1503 Ag	-	-	plated bronze
89	531 Ag	1.7	-	plated bronze

Coin type (within the ONAV Group)	Anokhin no.	Weight (g)	Diameter (mm)	Remarks
90	1043 Ag	-	-	plated bronze
91	1051 Ag	3.04	-	plated bronze
92	593 Ag	2.34	-	plated bronze
93	1221 Ag	2.15	-	plated bronze
94	549 Ag	2.67	-	plated bronze
95	1068 Ag	2.34	-	plated bronze
96	1101 Ag	2.34	-	plated bronze
97	1339 Ag	2.59	-	plated bronze
98	1111 Ag	2.34	-	plated bronze
99	1041 Ag	-	-	plated bronze
100	564 Ag	2.08	-	plated bronze
101	1450 Ag	2.34	-	plated bronze
102	582 Ag	2.26	-	plated bronze
103	1456 Ag	-	-	plated bronze
104	1440 Ag	-	-	plated bronze
105	949 Ag	2.6	-	plated bronze
106	1329 Ag	-	-	plated bronze, pierced
107	665 Ag	2.4	-	plated bronze
108	1405 Ag	2.4	-	plated bronze
109	1325 Ag	1.6	-	plated bronze
110	695 Ag	2.75	-	plated bronze
111	763 Ag	2.09	-	plated bronze
112	1147 Ag	-	-	plated bronze
113	1215 Ag	-	-	plated bronze
114	923 Ag	-	-	plated bronze
115	1027 Ag	2.14	-	plated bronze
117	1160 Ag	2.39	-	plated bronze
118	917 Ag	-	-	plated bronze
119	922 Ag	-	-	plated bronze
120	1120 Ag	1.85	-	plated bronze
121	965 Ag	-	-	plated bronze
122	924 Ag	1.86	-	plated bronze
123	1014 Ag	2.5	-	plated bronze
124	750 Ag	2.12	-	plated bronze
125	1264 Ag	2.13	-	plated bronze
126	753 Ag	-	-	plated bronze
127	1452 Ag	2.4	-	plated bronze
128	796 Ag	1.55	-	plated bronze
129	1066 Ag	-	-	plated bronze
130	1065 Ag	-	-	plated bronze
131	1177 Ag	-	-	plated bronze, pierced
131	1193 Ag	1.38	-	plated bronze
132	1044 Ag	2.7	-	plated bronze

Coin type (within the ONAV Group)	Anokhin no.	Weight (g)	Diameter (mm)	Remarks
133	1521 Ag	-	-	silver
134	1093 Ag	-	-	plated bronze
135	747 Ag	2.1	-	plated bronze
136	1355 Ag	2.1	-	plated bronze
137	1277 Ag	2.0	-	plated bronze
138	437 Ag	-	-	plated bronze
139	916 Ag	-	-	plated bronze
140	808 Ag	-	-	plated bronze
141	914 Ag	-	-	plated bronze
142	915 Ag	-	-	plated bronze
143	913 Ag	-	-	plated bronze
144	824 Ag	-	-	plated bronze
145	1079 Ag	-	-	plated bronze
146	1562 Ag	-	-	plated bronze
147	1326 Ag	-	-	plated bronze
148	840 Ag	1.81	-	plated bronze
149	1069 Ag	-	-	plated bronze
150	1139 Ag	-	-	plated bronze
151	1291 Ag	-	-	plated bronze
152	910 Ag	-	-	plated bronze
153	1136 Ag	-	-	plated bronze
154	1510 Ag	2.41	-	plated bronze
155	1070 Ag	1.87	-	plated bronze
156	1449 Ag	2.77	-	plated bronze
157	957 Ag	2.17	-	plated bronze
158	1064 Ag	2.77	-	plated bronze
159	1148 Ag	-	-	plated bronze
160	1559 Ag	-	-	plated bronze
161	1568 Ag	1.96	-	plated bronze
162	1534 Ag	-	-	plated bronze
163	1518 Ag	2.7	-	plated bronze
164	1128 Ag	1.73	-	plated bronze
165	918 Ag	-	-	plated bronze
166	1098 Ag	-	-	plated bronze
167	852 Ag	-	-	plated bronze
168	1129 Ag	2.36	-	plated bronze
169	1349 Ag	-	-	plated bronze
170	1048 Ag	2.31	-	plated bronze
171	1451 Ag	-	-	plated bronze
172	1430 Ag	2.51	-	plated bronze
173	898 Ag	2.51	-	plated bronze
174	1435 Ag	2.2	-	plated bronze
175	911 Ag	-	-	plated bronze

Coin type (within the ONAV Group)	Anokhin no.	Weight (g)	Diameter (mm)	Remarks
176	1229 Ag	2.7	-	plated bronze
177	912 Ag	-	-	plated bronze
178	929 Ag	-	-	plated bronze, pierced
179	1080 Ag	2.97	-	plated bronze
180	1274 Ag	-	18	plated bronze
182	576 Ag	2.29	-	plated bronze
183	851 Ag	2.19	-	plated bronze

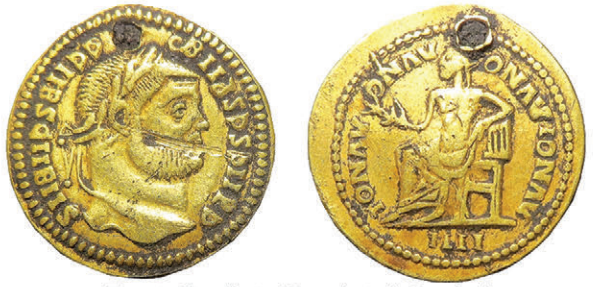
Table 5.2. Coin attributed to the Iezer hoard (eastern Romania) (after: Munteanu and Popușoi 2015, 1–34).

Coin type (within the ONAV Group)	Anokhin no.	Weight (g)	Diameter (mm)	Axis	Remarks
11	238 Ag	1.79	16	10–11h	subaeratus

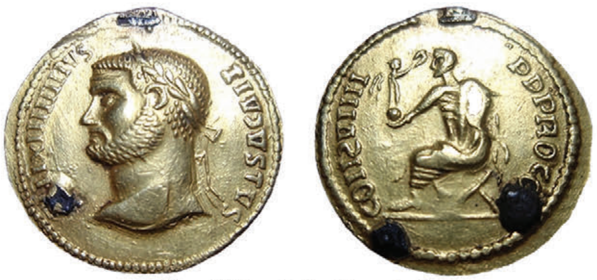
CATALOGUE

Part I.

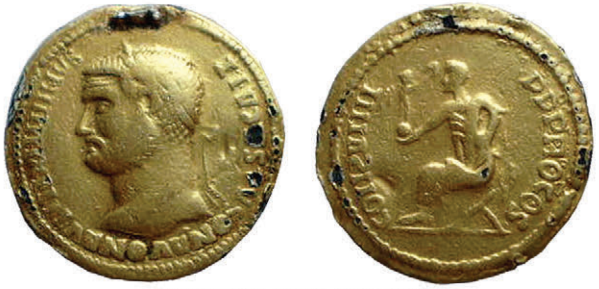
List of coin types (and coin dies) of the ONAV Group



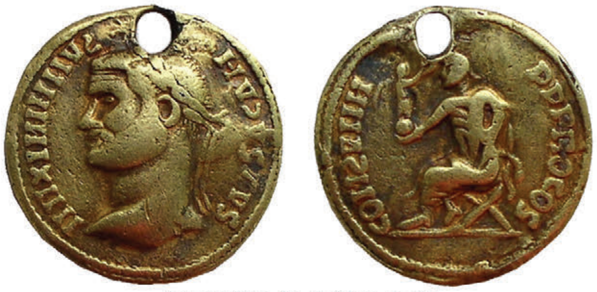
Type 1: Obv. die 1a / Rev. die 1a (+ Punch 1)
(Anokhin 115 Au)



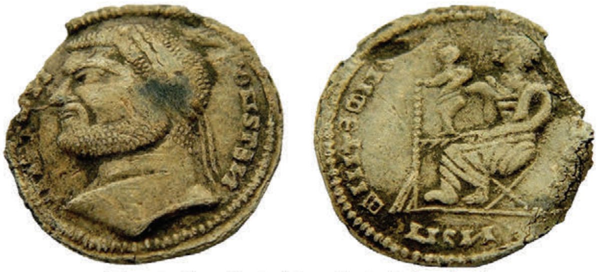
Type 2: Obv. die 2a / Rev. die 2a
(Anokhin 72 Au)



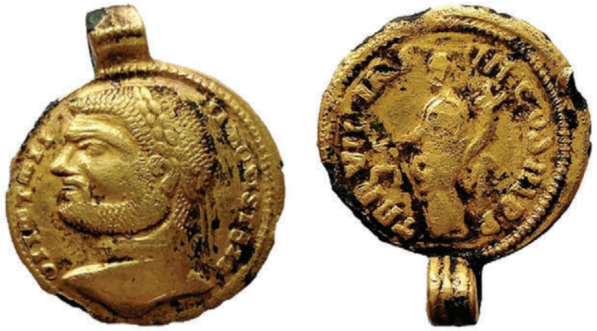
Type 3: Obv. die 2b / Rev. die 2a
(Anokhin 72 Au)



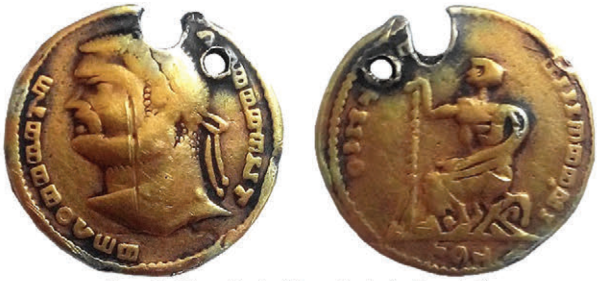
Type 4: Obv. die 2c / Rev. die 2a
(Anokhin 373 Au)



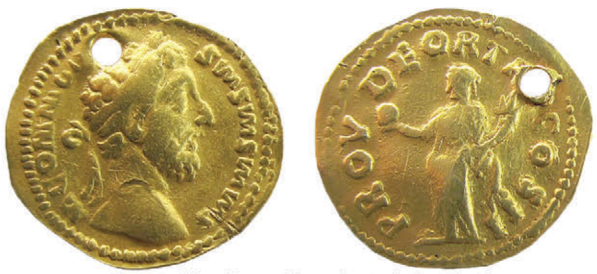
Type 5: Obv. die 3a / Rev. die 3a (+Punch 2)
(Anokhin 523 Ag)



Type 6: Obv. die 3a / Rev. die 4a (+Punch 2)
(Anokhin 312 Au)

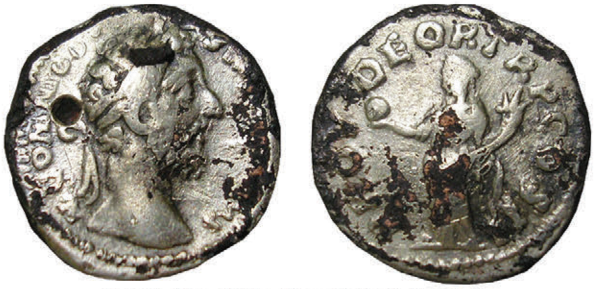


Type 7: Obv. die 4a / Rev. die 5a (+ Punch 2)
(Anokhin 252 Au)

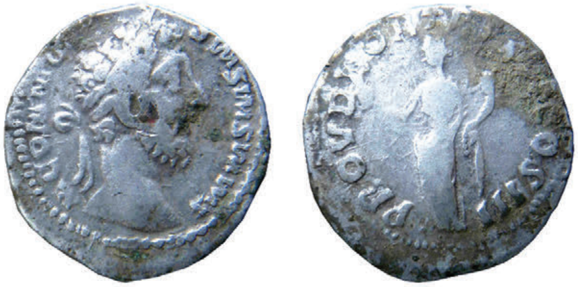


Type 8: Obv. die 5a / Rev. die 6a (+ Punch 3)
(Anokhin 361 Au)

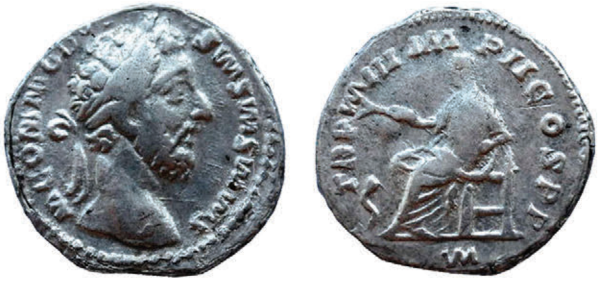
Not to scale, approximately 2:1



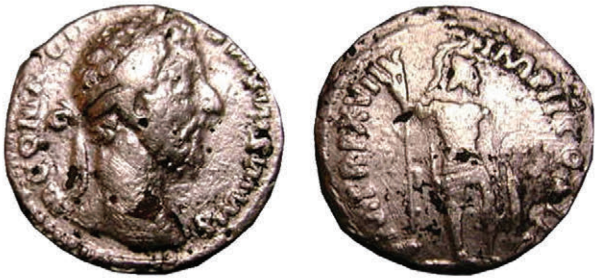
Type 9: Obv. die 5a / Rev. die 6a (+ Punch 3)
(Anokhin 1099 Ag)



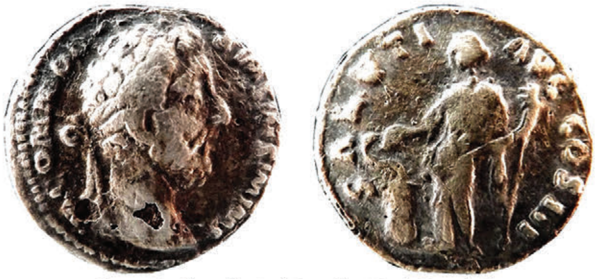
Type 10: Obv. die 5a / Rev. die 7a (+ Punch 3)
(Anokhin 208 Ag)



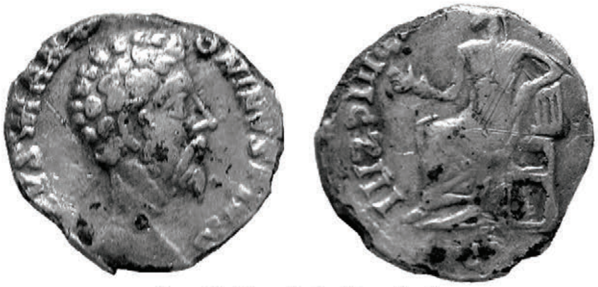
Type 11: Obv. die 5a / Rev. die 8a (+ Punch 3)
(Anokhin 238 Ag)



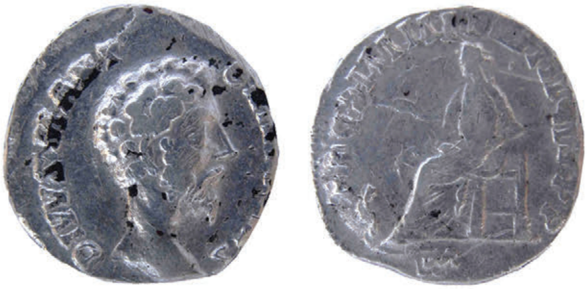
Type 12: Obv. die 5a / Rev. die 9a (+Punch 3)
(Anokhin 782 Ag)



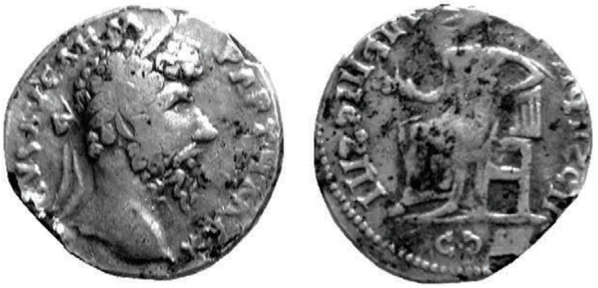
Type 13: Obv. die 5a / Rev. die 10a (+Punch 3)
(Anokhin 1149 Ag)



Type 14: Obv. die 6a / Rev. die 1b
(Anokhin 195 Ag)

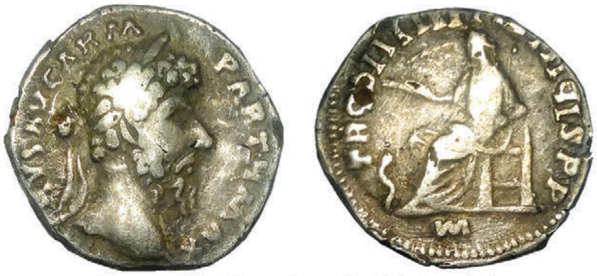


Type 15: Obv. die 6a / Rev. die 8b (+Punch 3)
(Anokhin 190 Ag)

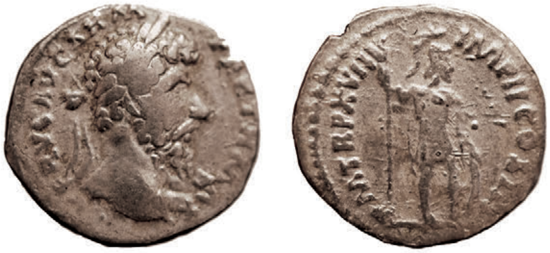


Type 16: Obv. die 7a / Rev. die 1b
(Anokhin 194 Ag)

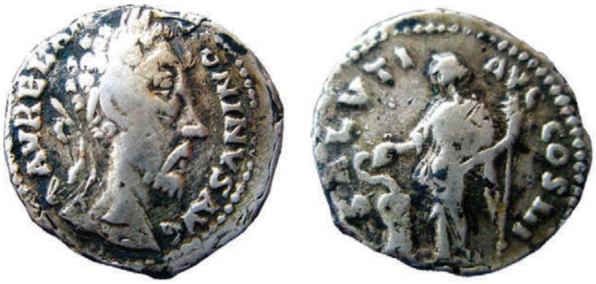
Not to scale, approximately 2:1



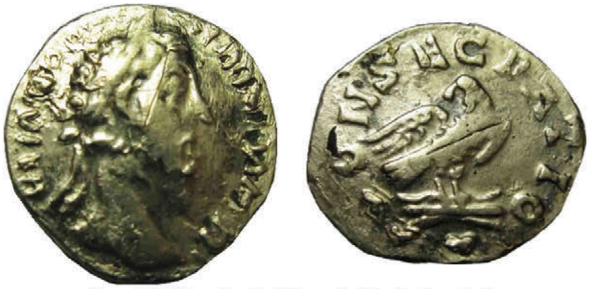
Type 17: Obv. Die 7a / Rev. die 8b (+ Punch 3)
(Anokhin 17 Ag)



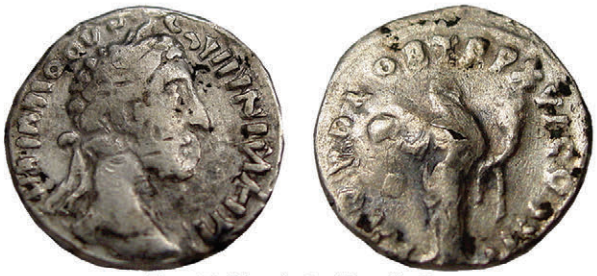
Type 18: Obv. die 7a / Rev. die 9a
(not listed by Anokhin)



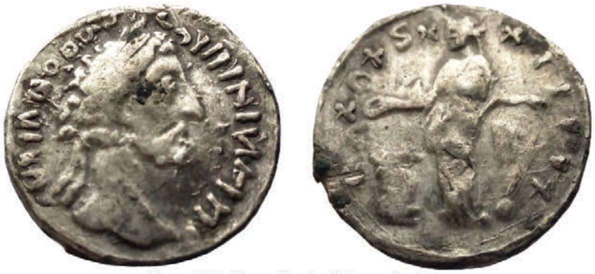
Type 19: Obv. die 8a / Rev. die 10a
(Anokhin 18 Ag)



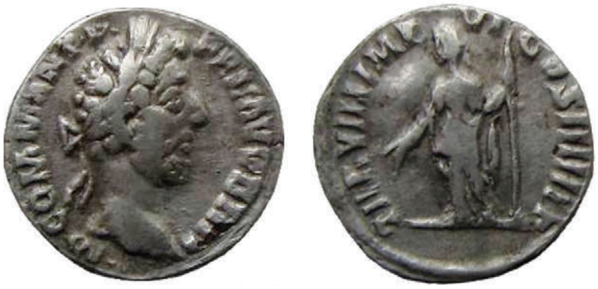
Type 20: Obv. die 9a / Rev. die 11a (+ Punch 3)
(Anokhin 25 Ag)



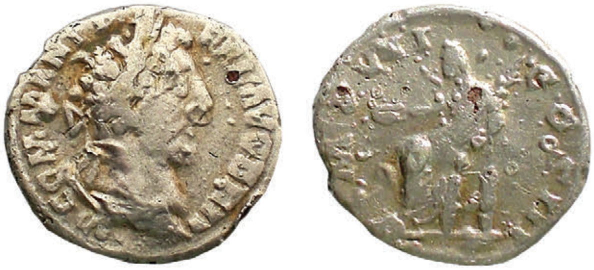
Type 21: Obv. die 9a / Rev. die 12a
(Anokhin 440 Ag)



Type 22: Obv. die 9a / Rev. die 13a
(Anokhin 591 Ag)

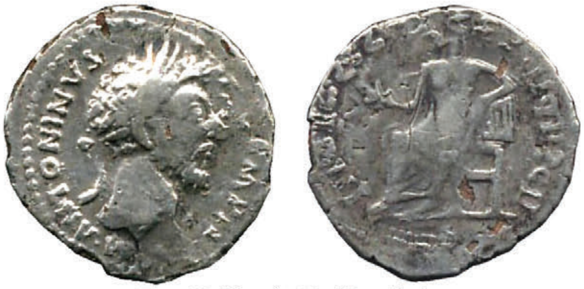


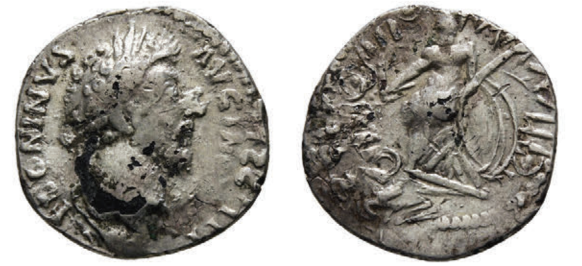
Type 23: Obv. die 10a / Rev. die 14a
(Anokhin 51 Ag)

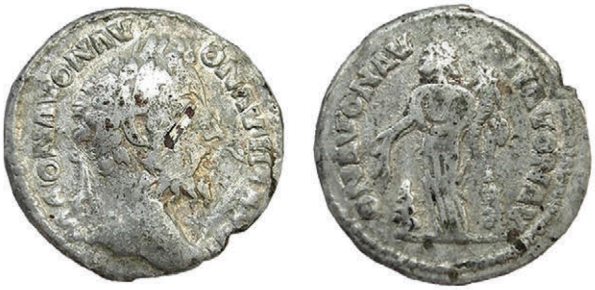


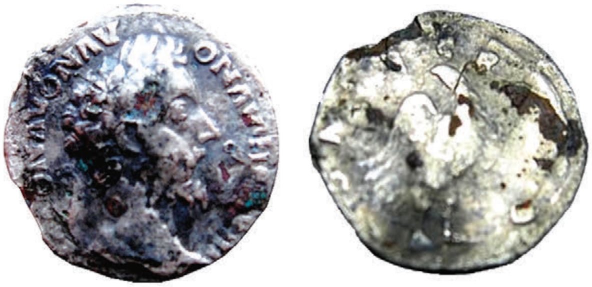
Type 24: Obv. die 10a / Rev. die 15a
(Anokhin 1297 Ag)

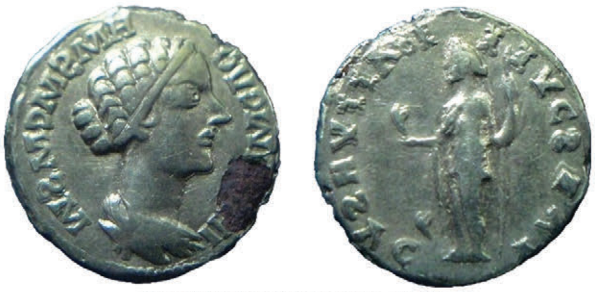
Not to scale, approximately 2:1

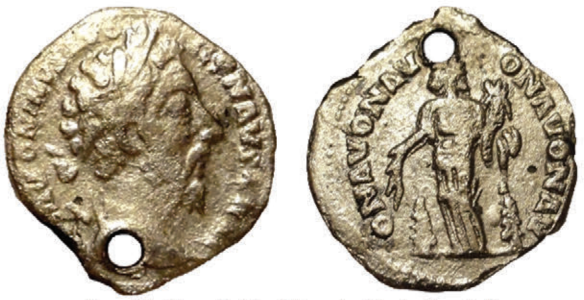

Type 25: Obv. die 11a / Rev. die 1c
(Anokhin 53 Ag)

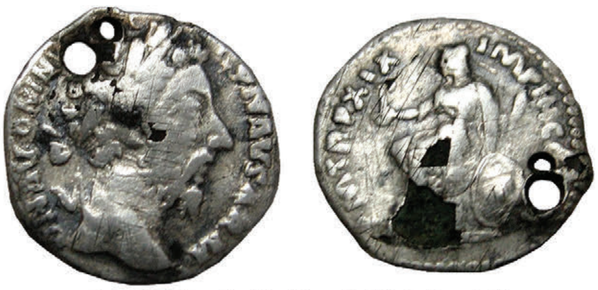

Type 26: Obv. die 11b / Rev. die 56a
(not listed by Anokhin)

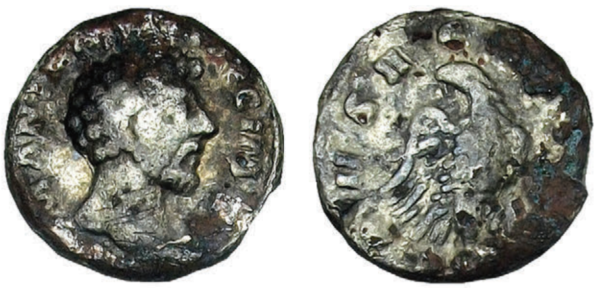

Type 27: Obv. die 12a / Rev. die 16a (+ Punch 1)
(Anokhin 84 Ag)


Type 28: Obv. die 12a / Rev. die 17a (+ Punch 1)
(Anokhin 193 Ag)

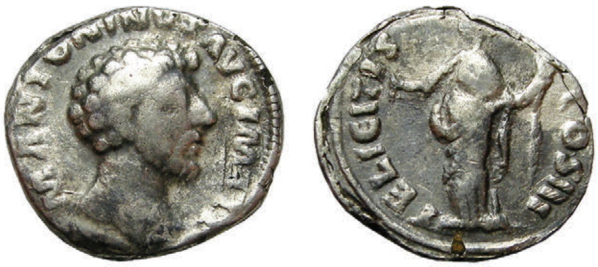

Type 29: Obv. die 13a / Rev. die 58a
(Anokhin 118 Ag)


Type 30: Obv. die 14a / Rev. die 16a (+ Punch 1)
(Anokhin 1060 Ag)

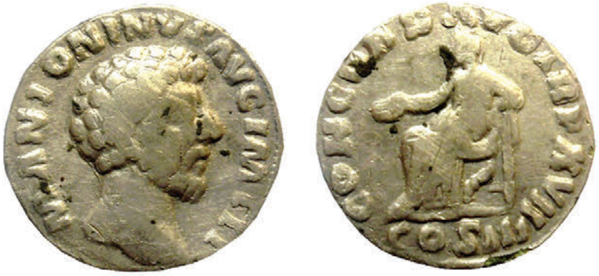

Type 31: Obv. die 14a / Rev. die 18a (+ Punch 1)
(Anokhin 134 Ag)


Type 32: Obv. die 15a / Rev. die 17a
(Anokhin 429 Ag)

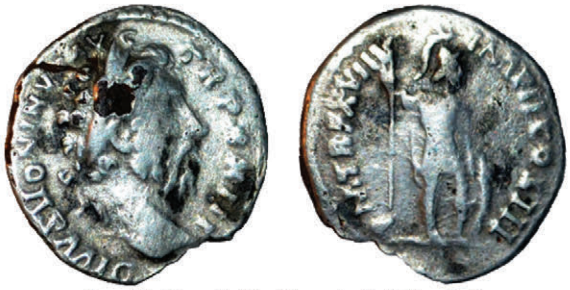
Not to scale, approximately 2:1



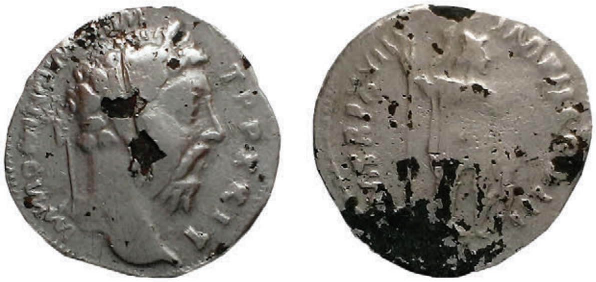
Type 33: Obv. die 15a / Rev. die 19a
(Anokhin 152 Ag)



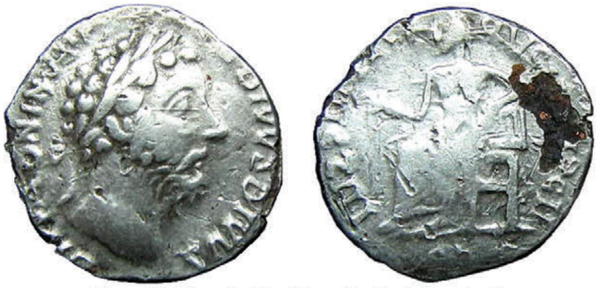
Type 34: Obv. die 15a / Rev. die 20a
(Anokhin 1163 Ag)



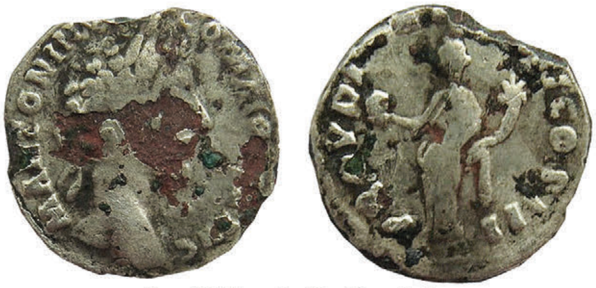
Type 35: Obv. die 16a / Rev. die 9a (+Punch 4)
(Anokhin 181 Ag)



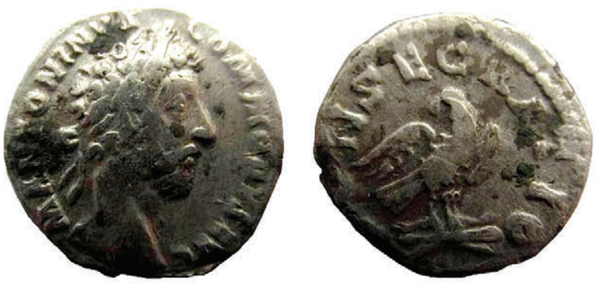
Type 36: Obv. die 17a / Rev. die 9a (+Punch 3)
(Anokhin 1351 Ag)



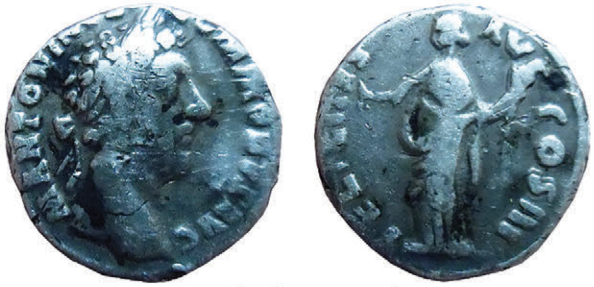
Type 37: Obv. die 18a / Rev. die 1b (+ Punch 4)
(Anokhin 513 Ag)



Type 38: Obv. die 19a / Rev. die 7a
(Anokhin 1010 Ag)

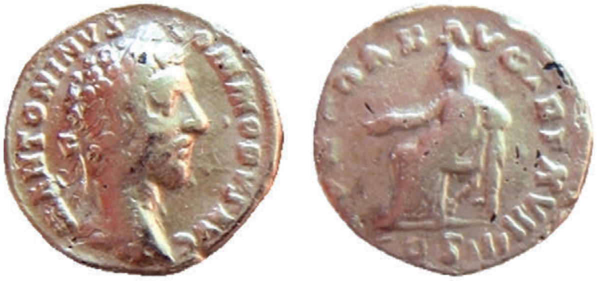


Type 39: Obv. die 19a / Rev. die 11a
(Anokhin 864 Ag)

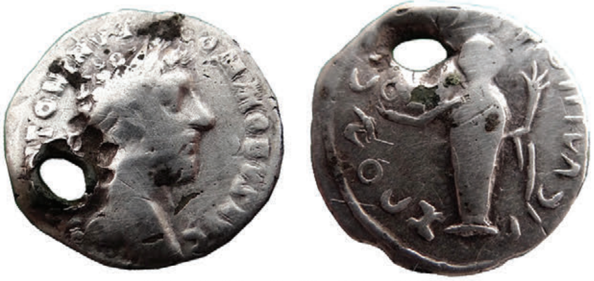


Type 40: Obv. die 19a / Rev. die 19a
(Anokhin 187 Ag)

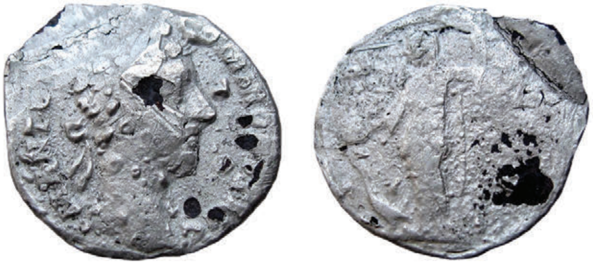
Not to scale, approximately 2:1



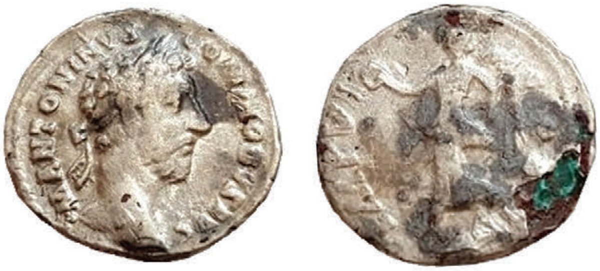
Type 41: Obv. die 19a / Rev. die 20a
(Anokhin 506 Ag)



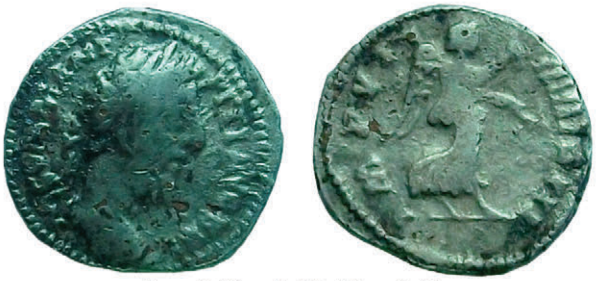
Type 42: Obv. die 19a / Rev. die 21a
(Anokhin 752 Ag)



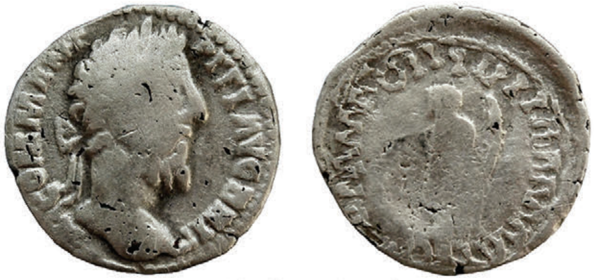
Type 43: Obv. die 19a / Rev. die 22a
(Anokhin 1533 Ag)



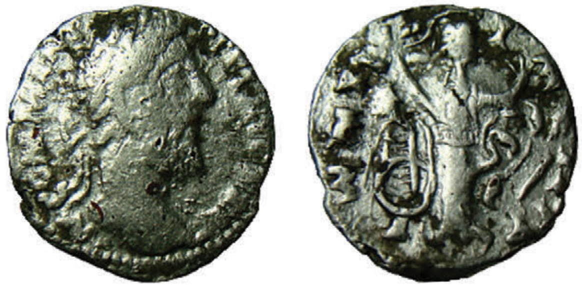
Type 44: Obv. die 19a / Rev. die 23a
(Anokhin 1570 Ag)



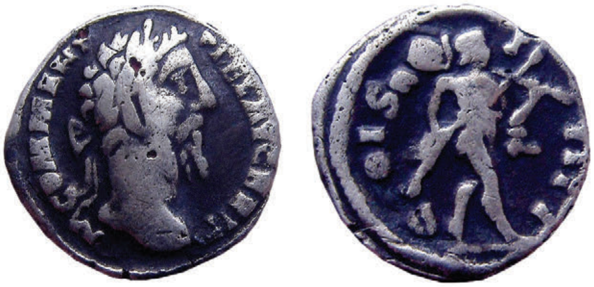
Type 45: Obv. die 20a / Rev. die 24a
(Anokhin 189 Ag)



Type 46: Obv. die 20a / Rev. die 25a
(Anokhin 1501 Ag)

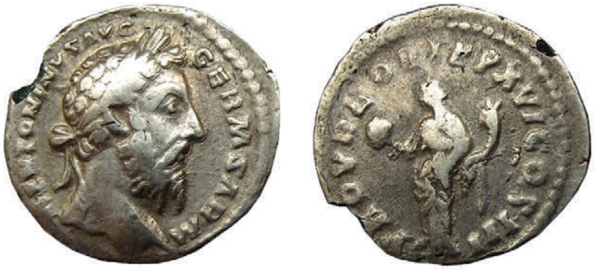


Type 47: Obv. die 20a / Rev. die 26a
(Anokhin 375 Ag)

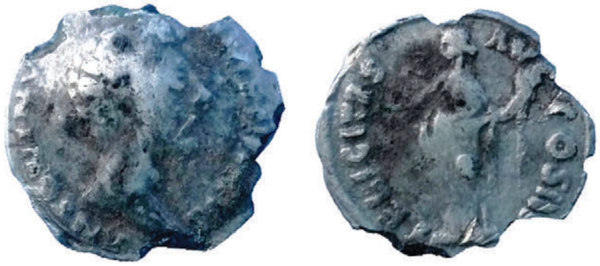


Type 48: Obv. die 20a / Rev. die 27a
(Anokhin 1394 Ag)

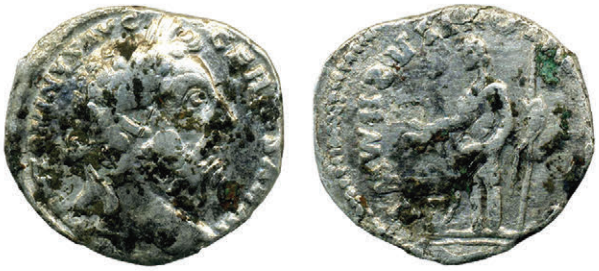
Not to scale, approximately 2:1



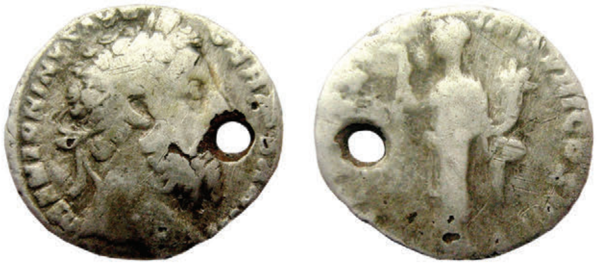
Type 49: Obv. Die 21a / Rev. die 12a
(Anokhin 908 Ag)



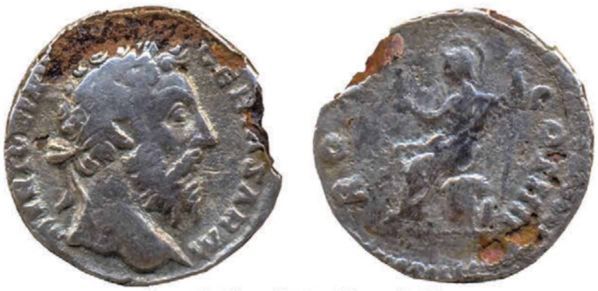
Type 50: Obv. die 21a / Rev. die 19a
(Anokhin 869 Ag)



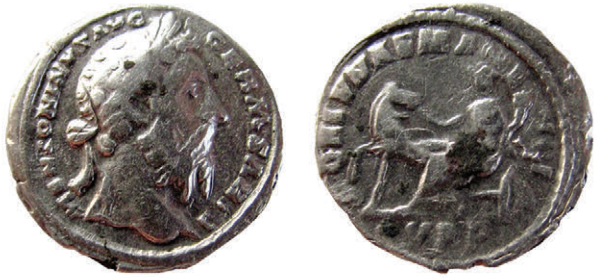
Type 51: Obv. die 21a / Rev. die 28a
(Anokhin 219 Ag)



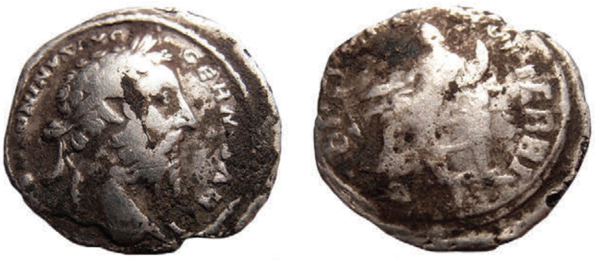
Type 52: Obv. die 21a / Rev. die 29a
(Anokhin 921 Ag)



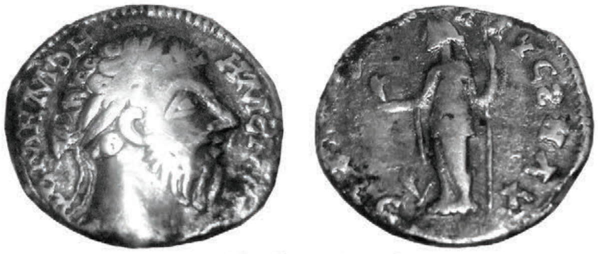
Type 53: Obv. die 21a / Rev. die 30a
(Anokhin 907 Ag)



Type 54: Obv. die 21a / Rev. die 31a
(Anokhin 1042 Ag)

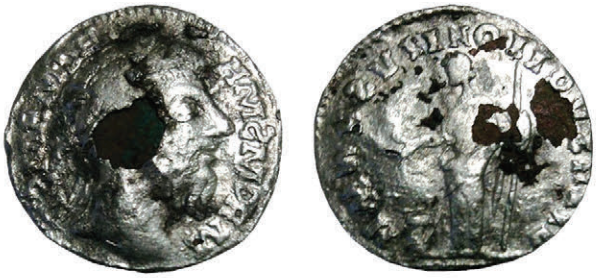


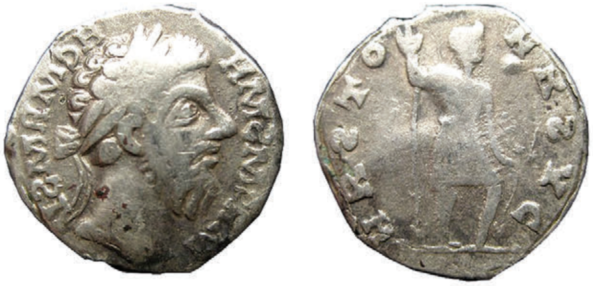
Type 55: Obv. die 21a / Rev. die 32a
(Anokhin 1067 Ag)

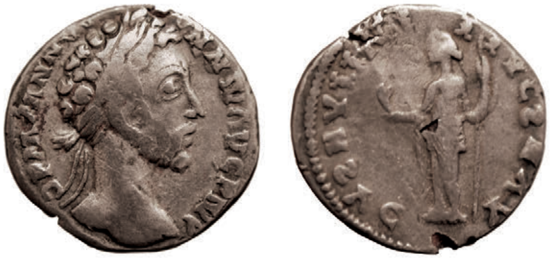


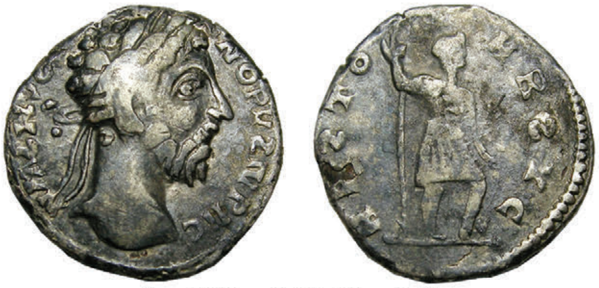
Type 56: Obv. die 22a / Rev. die 58a
(Anokhin 692 Ag)

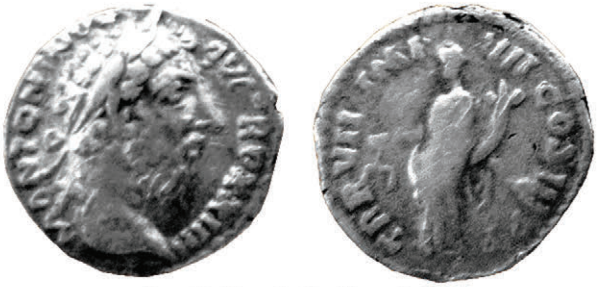
Not to scale, approximately 2:1

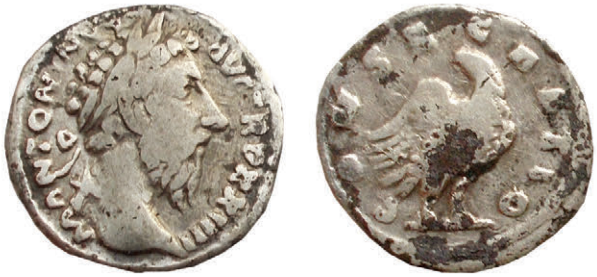

Type 57: Obv. die 22a / Rev. die 28a
(Anokhin 972 Ag)

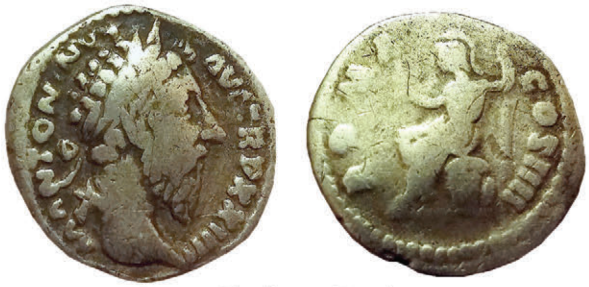

Type 58: Obv. die 22a / Rev. die 33a
(Anokhin 237 Ag)

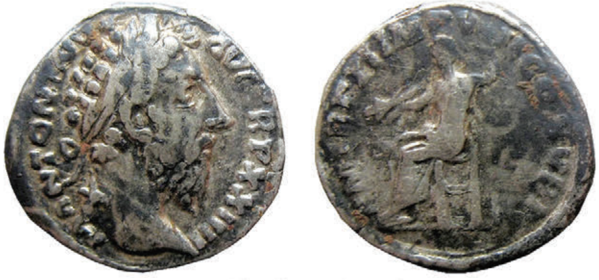

Type 59: Obv. die 23a / Rev. die 58a
(not listed by Anokhin)


Type 60: Obv. die 23a / Rev. die 34a
(Anokhin 250 Ag)

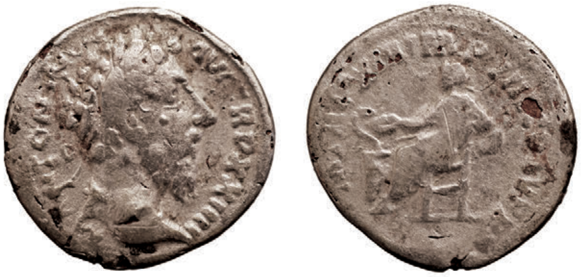

Type 61: Obv. die 24a / Rev. die 04a
(Anokhin 1126 Ag)


Type 62: Obv. die 24a / Rev. die 17a
(Anokhin 1535 Ag)

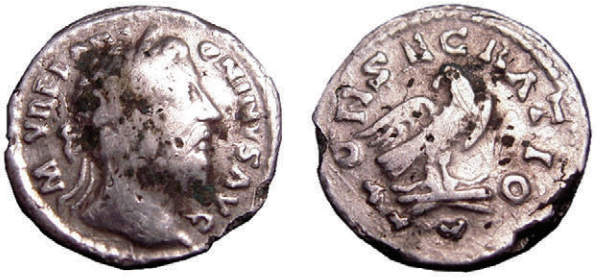

Type 63: Obv. die 24a / Rev. die 30a
(Anokhin 1404 Ag)


Type 64: Obv. die 24a / Rev. die 35a
(Anokhin 282 Ag)

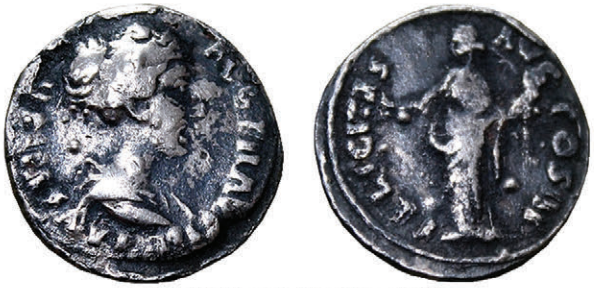
Not to scale, approximately 2:1



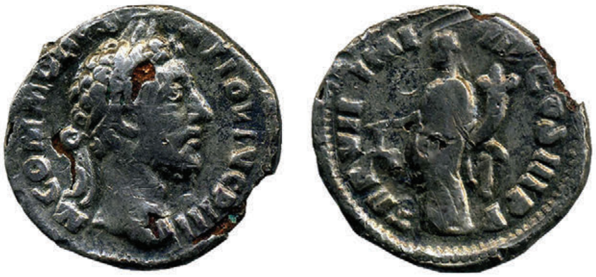
Type 65: Obv. die 24a / Rev. die 51a
(not listed by Anokhin)



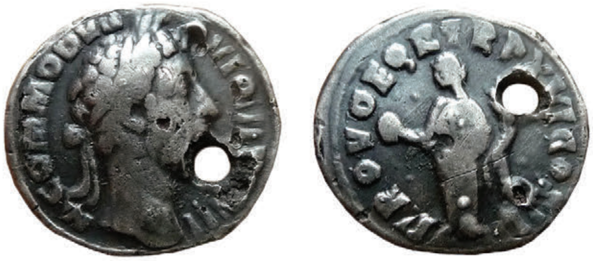
Type 66: Obv. die 25a / Rev. die 11a
(Anokhin 311 Ag)



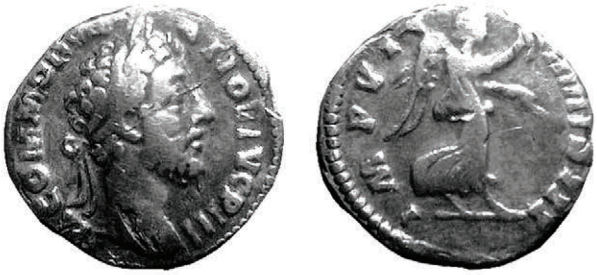
Type 67: Obv. die 26a / Rev. die 19a
(Anokhin 326 Ag)



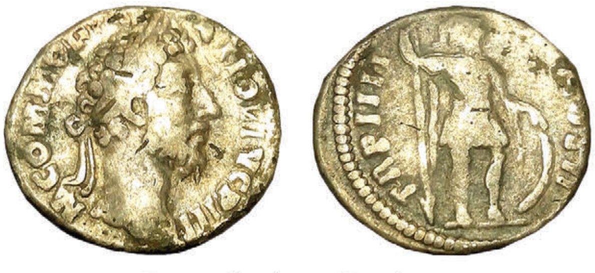
Type 68: Obv. die 27a / Rev. die 4a
(Anokhin 343 Ag)



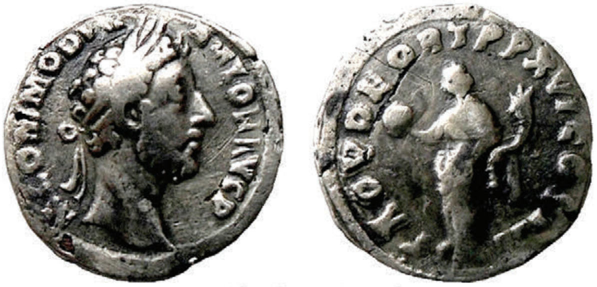
Type 69: Obv. die 27a / Rev. die 12a
(Anokhin 1246 Ag)



Type 70: Obv. die 27a / Rev. die 24a
(Anokhin 602 Ag)

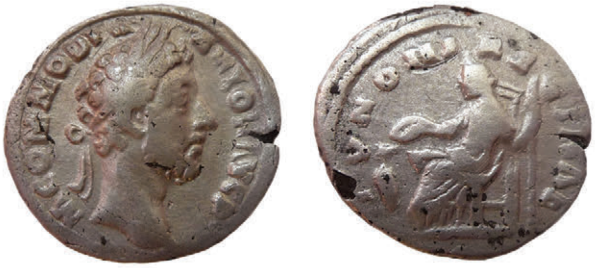


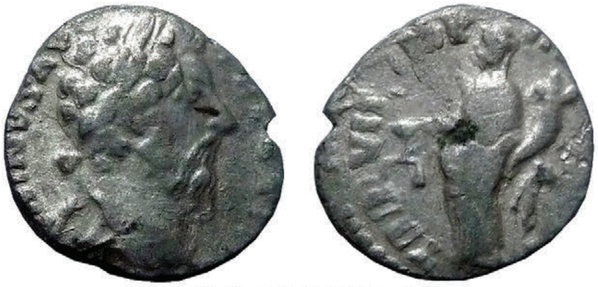
Type 71: Obv. die 27a / Rev. die 37a
(Anokhin 1227 Ag)

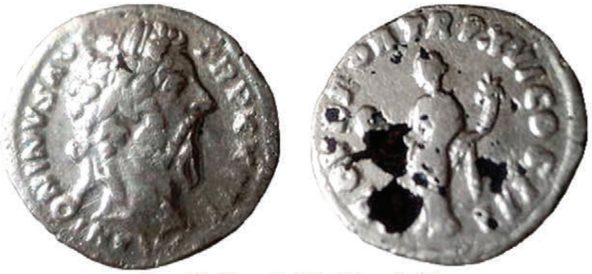


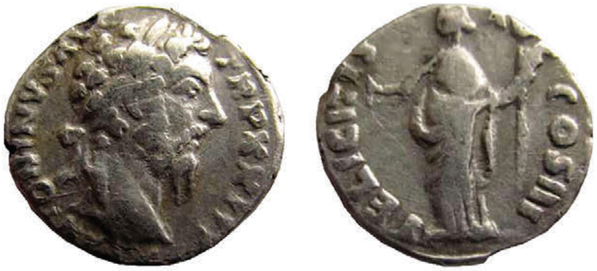
Type 72: Obv. die 27a / Rev. die 12a
(Anokhin 745 Ag)

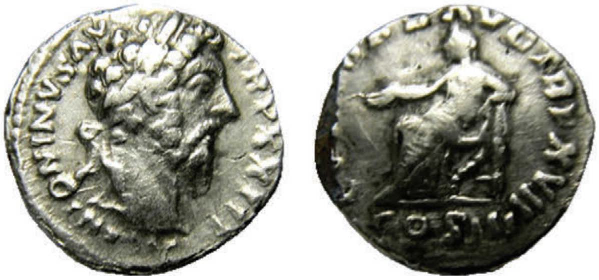
Not to scale, approximately 2:1

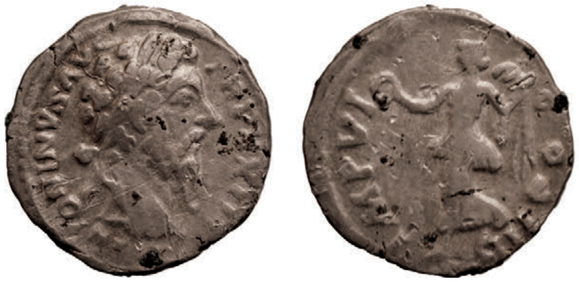

Type 73: Obv. die 27a / Rev. die 36a
(Anokhin 838 Ag)

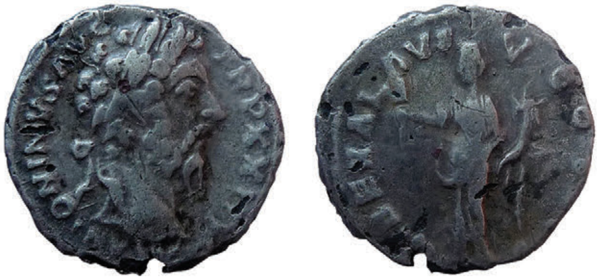

Type 74: Obv. die 28a / Rev. die 4a
(Anokhin 741 Ag)

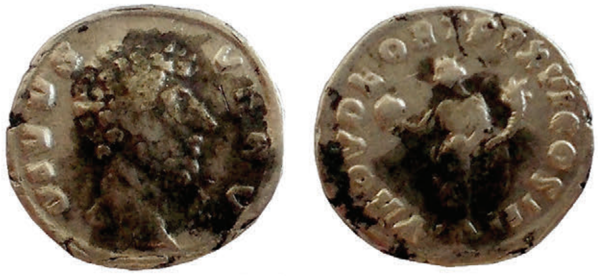

Type 75: Obv. die 28a / Rev. die 12a
(Anokhin 1412 Ag)


Type 76: Obv. die 28a / Rev. die 19a
(Anokhin 346 Ag)

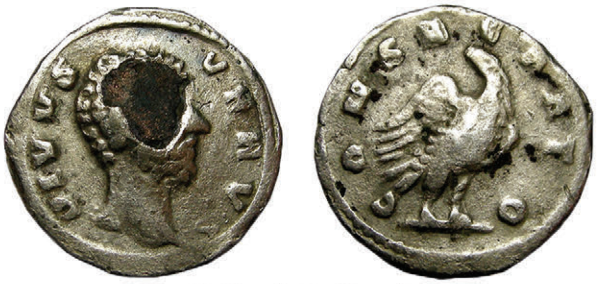

Type 77: Obv. die 28a / Rev. die 20a
(Anokhin 445 Ag)


Type 78: Obv. die 28a / Rev. die 23a
(not listed by Anokhin)

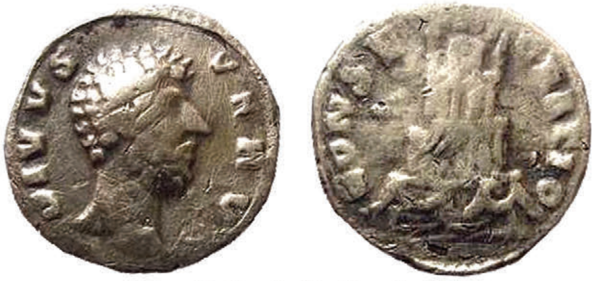

Type 79: Obv. die 28a / Rev. die 38a
(Anokhin 688 Ag)


Type 80: Obv. die 29a / Rev. die 12a
(Anokhin 460 Ag = Anokhin 1138 Ag)

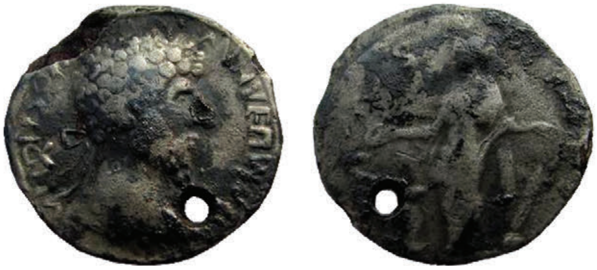
Not to scale, approximately 2:1



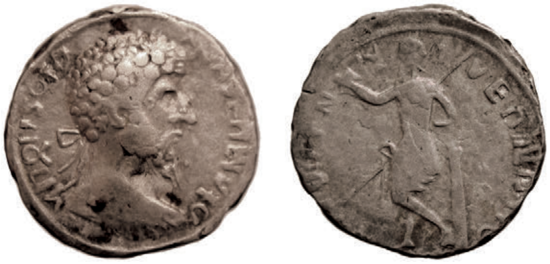
Type 81: Obv. die 29a / Rev. die 17a
(Anokhin 447 Ag)



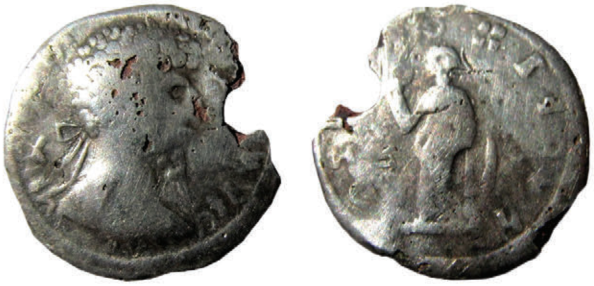
Type 82: Obv. die 29a / Rev. die 39a
(Anokhin 1192 Ag)



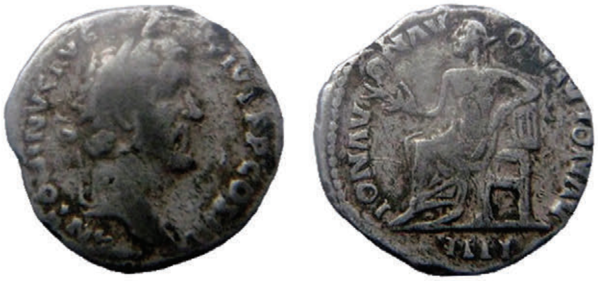
Type 83: Obv. Die 30a / Rev. die 13a
(Anokhin 457 Ag)



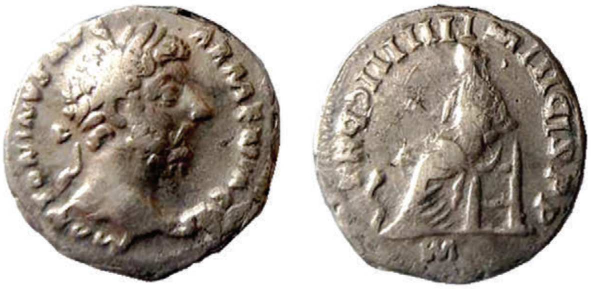
Type 84: Obv. die 30a / Rev. die 55a
(not listed by Anokhin)



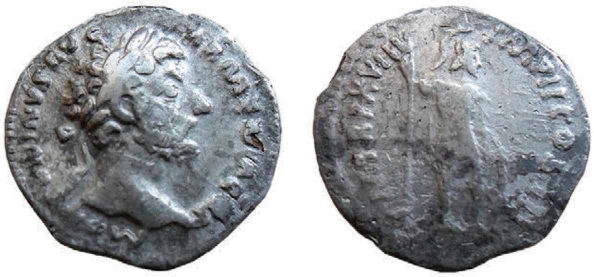
Type 85: Obv. die 30a / Rev. die 57a
(Anokhin 1515 Ag)



Type 86: Obv. die 31a / Rev. die 1a (+Punch 1)
(Anokhin 478 Ag)

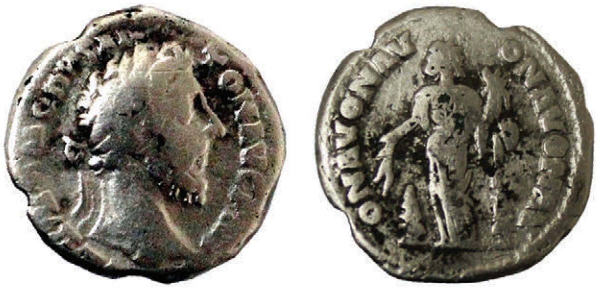


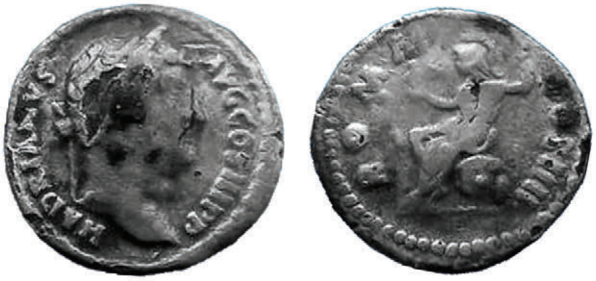
Type 87: Obv. die 32a / Rev. die 8b (+ Punch 3)
(Anokhin 526 Ag)

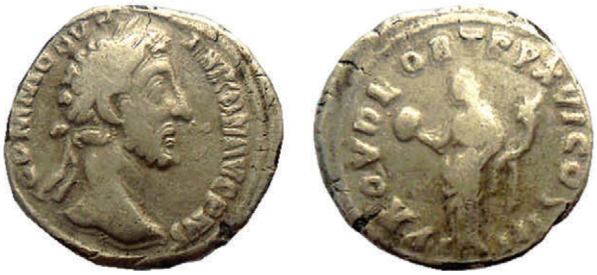


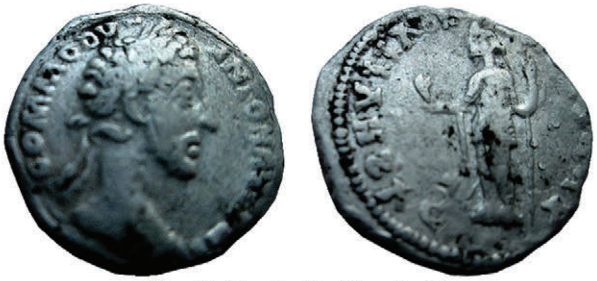
Type 88: Obv. die 32a / Rev. die 9a
(Anokhin 1503 Ag)

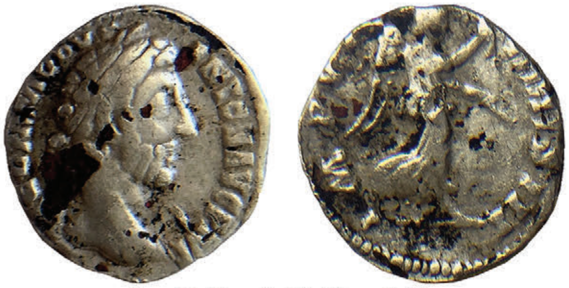
Not to scale, approximately 2:1

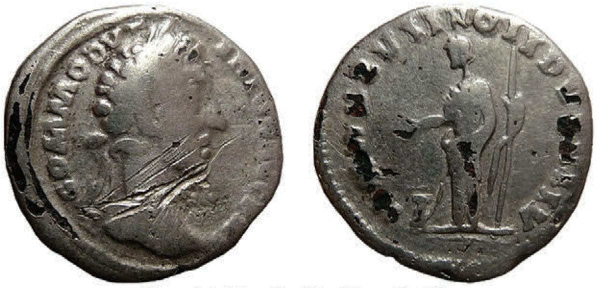

Type 89: Obv. die 33a / Rev. die 16a (+ Punch 1)
(Anokhin 531 Ag)

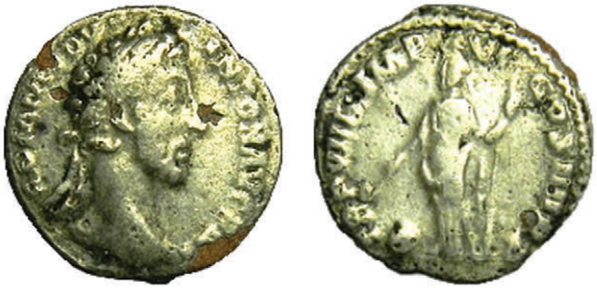

Type 90: Obv. die 34a / Rev. die 30a
(Anokhin 1043 Ag)

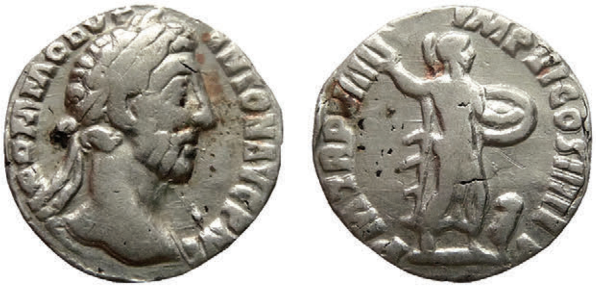

Type 91: Obv. die 35a / Rev. die 12a
(Anokhin 1051 Ag)


Type 92: Obv. die 35a / Rev. die 58a
(Anokhin 593 Ag)

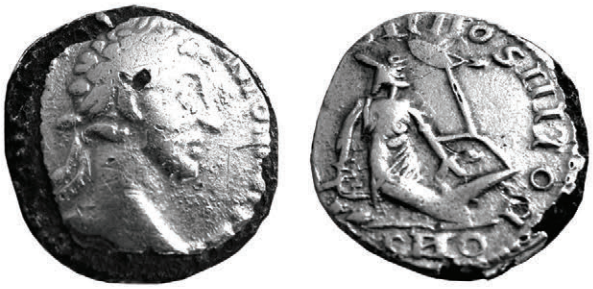

Type 93: Obv. die 35a / Rev. die 24a
(Anokhin 1221 Ag)


Type 94: Obv. die 35a / Rev. die 28a
(Anokhin 549 Ag)

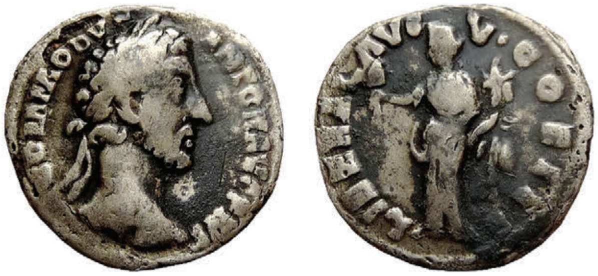

Type 95: Obv. die 35a / Rev. die 34a
(Anokhin 1068 Ag)


Type 96: Obv. die 35a / Rev. die 35a
(Anokhin 1101 Ag)

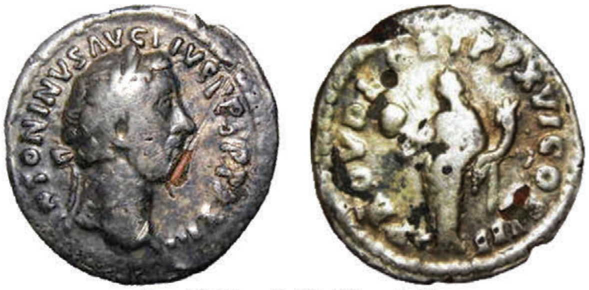
Not to scale, approximately 2:1



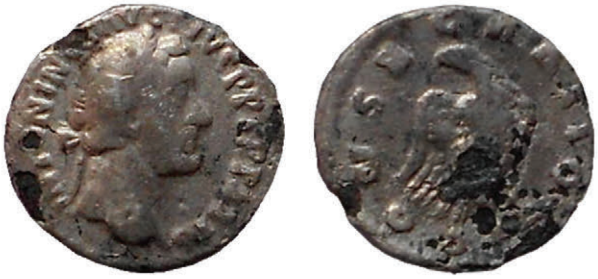
Type 97: Obv. die 35a / Rev. die 37a
(Anokhin 1339 Ag)



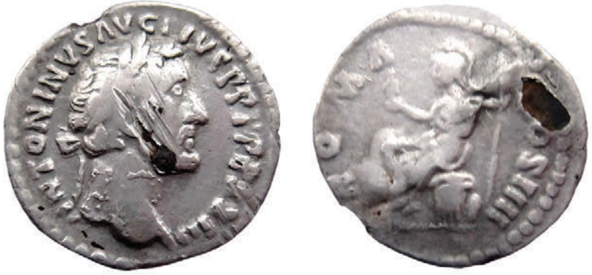
Type 98: Obv. die 35a / Rev. die 38a
(Anokhin 1111 Ag)



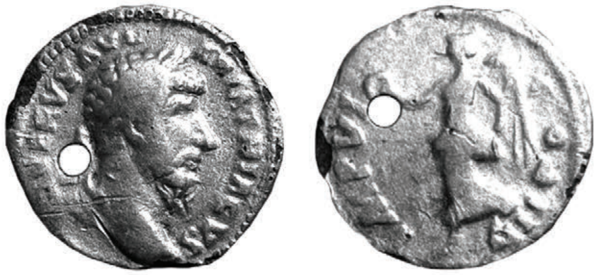
Type 99: Obv. die 36a / Rev. die 12a
(Anokhin 1041 Ag)



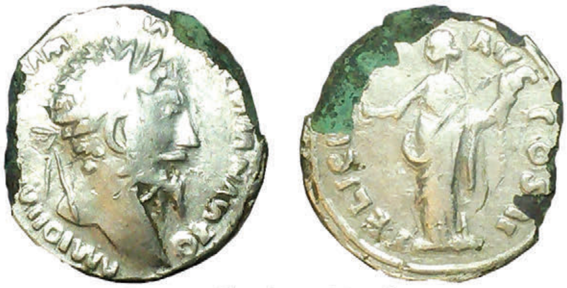
Type 100: Obv. die 36a / Rev. die 17a
(Anokhin 564 Ag)



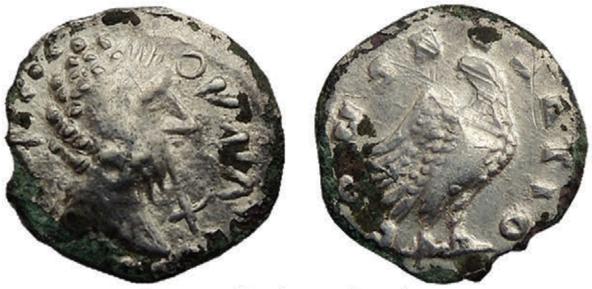
Type 101: Obv. die 36a / Rev. die 30a
(Anokhin 1450 Ag)



Type 102: Obv. die 37a / Rev. die 23a
(Anokhin 582 Ag)

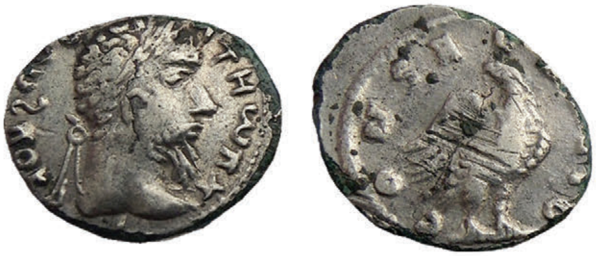


Type 103: Obv. die 38a / Rev. die 19a
(Anokhin 1456 Ag)

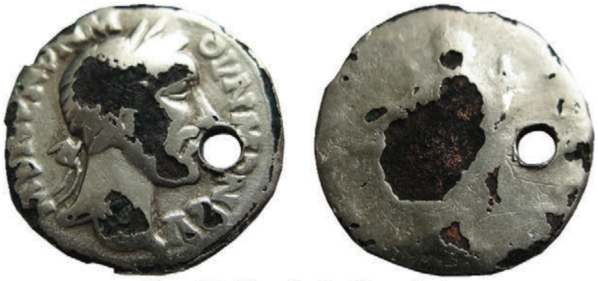


Type 104: Obv. die 39a / Rev. die 17a
(Anokhin 1440 Ag)

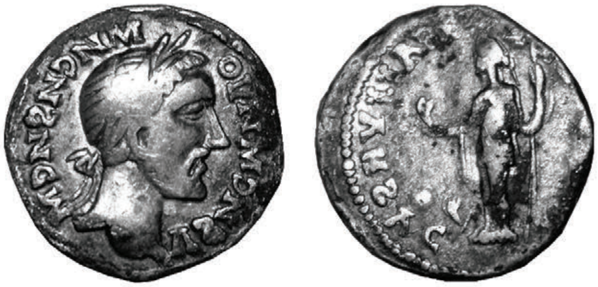
Not to scale, approximately 2:1



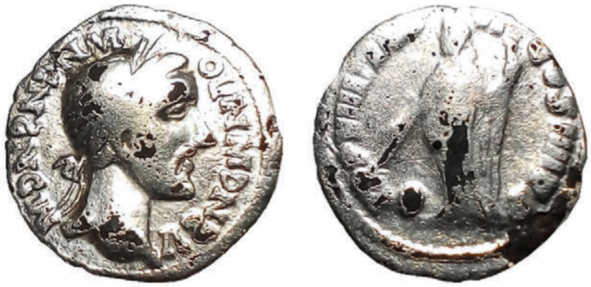
Type 105: Obv. die 40a / Rev. die 17a
(Anokhin 949 Ag)



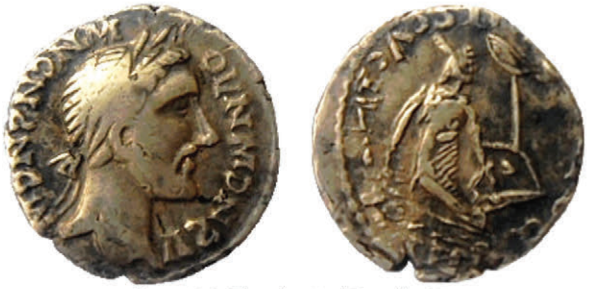
Type 106: Obv. die 41a / Rev. die 4a
(Anokhin 1329 Ag)



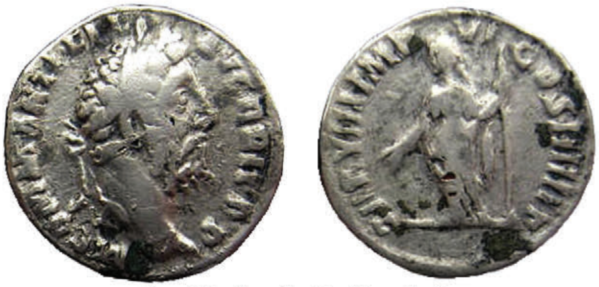
Type 107: Obv. die 41a / Rev. die 58a
(Anokhin 665 Ag)



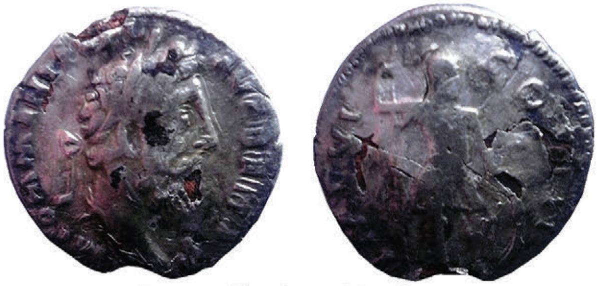
Type 108: Obv. die 41a / Rev. die 34a
(Anokhin 1405 Ag)



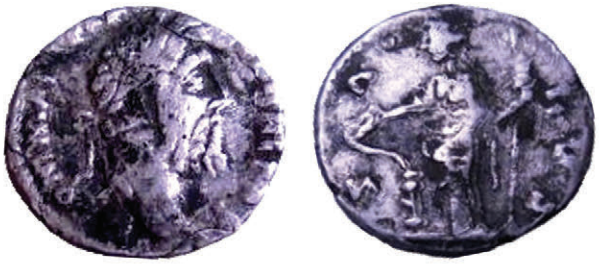
Type 109: Obv. die 41a / Rev. die 37a
(Anokhin 1325 Ag)



Type 110: Obv. die 42a / Rev. die 14a
(Anokhin 695 Ag)

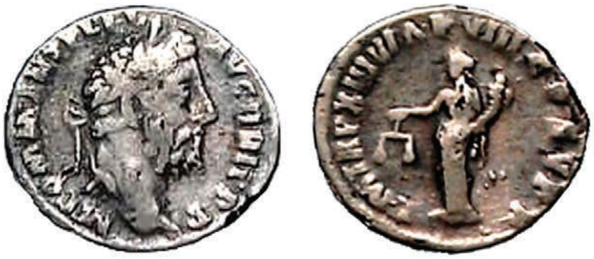


Type 111: Obv. die 42a / Rev. die 38a
(Anokhin 763 Ag)

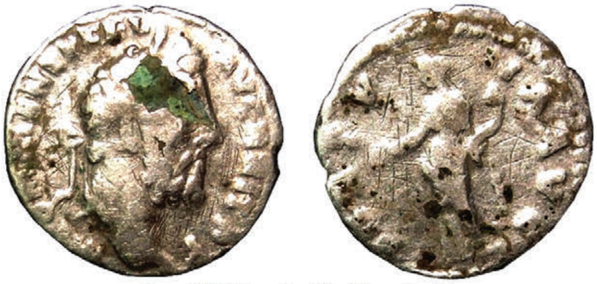


Type 112: Obv. die 42a / Rev. die 40a
(Anokhin 1147 Ag)

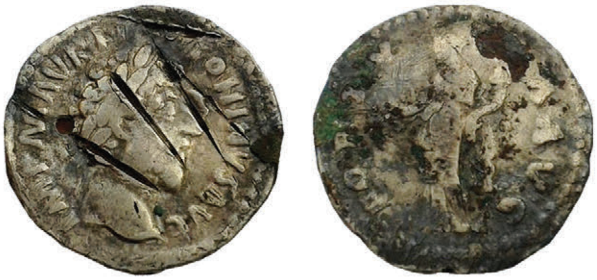
Not to scale, approximately 2:1



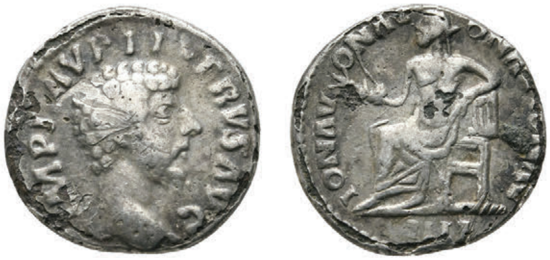
Type 113: Obv. die 42a / Rev. die 41a
(Anokhin 1215 Ag)



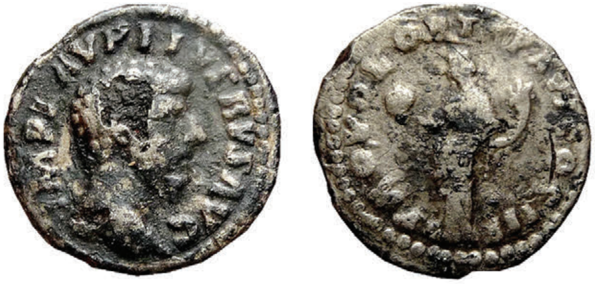
Type 114: Obv. die 42a / Rev. die 47a
(Anokhin 923 Ag)



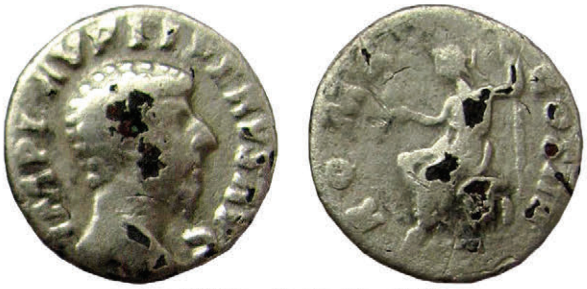
Type 115: Obv. die 43a / Rev. die 39a
(Anokhin 1027 Ag)



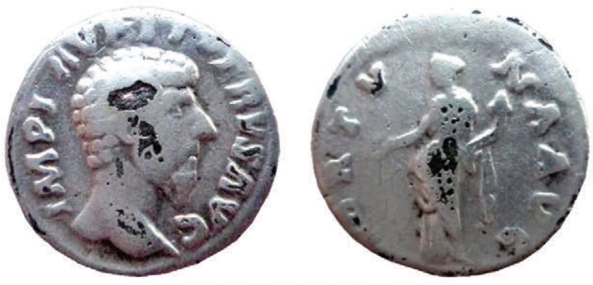
Type 116: Obv. die 44a / Rev. die 1a (+Punch 1)
(not listed by Anokhin)



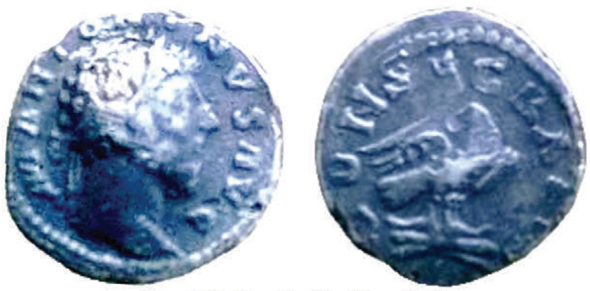
Type 117: Obv. die 44a / Rev. die 12a
(Anokhin 1160 Ag)



Type 118: Obv. die 44a / Rev. die 30a
(Anokhin 917 Ag)

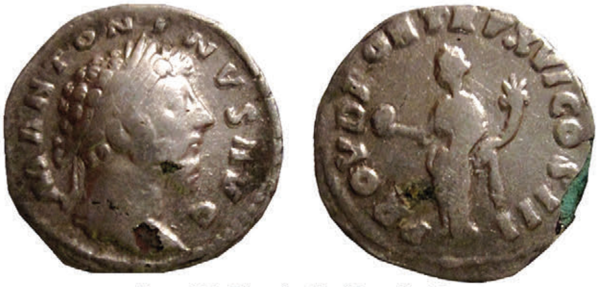


Type 119: Obv. die 44a / Rev. die 39a
(Anokhin 922 Ag)

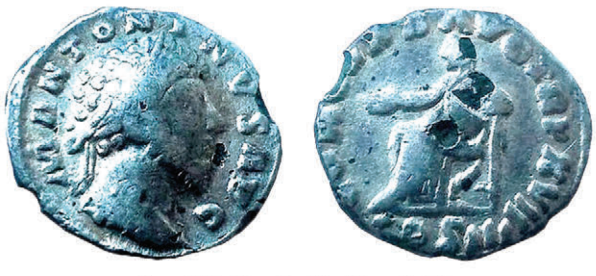


Type 120: Obv. die 45a / Rev. die 11a
(Anokhin 1120 Ag)

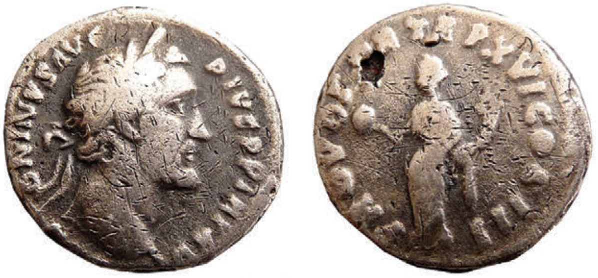
Not to scale, approximately 2:1



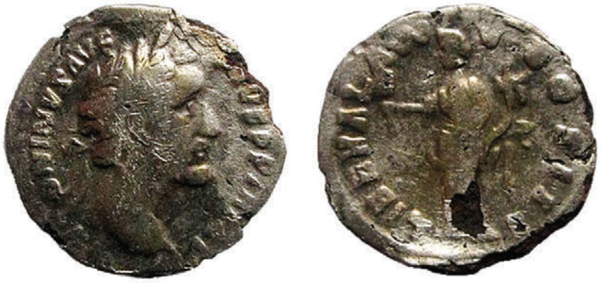
Type 121: Obv. die 45a / Rev. die 12a
(Anokhin 965 Ag)



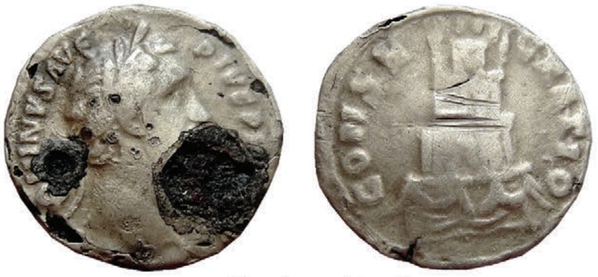
Type 122: Obv. die 45a / Rev. die 20a
(Anokhin 924 Ag)



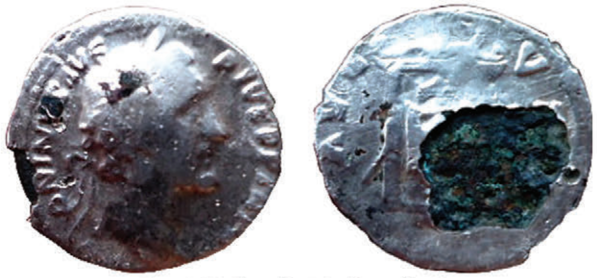
Type 123: Obv. die 46a / Rev. die 12a
(Anokhin 1014 Ag)



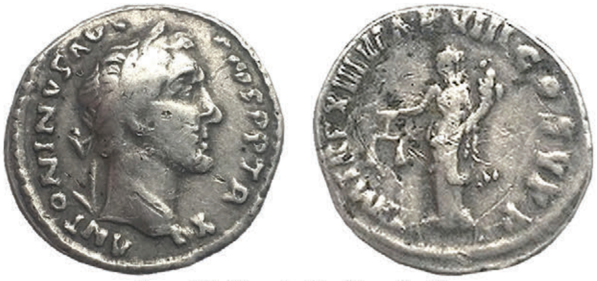
Type 124: Obv. die 46a / Rev. die 38a
(Anokhin 750 Ag)



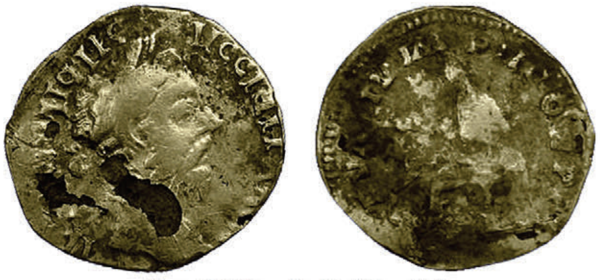
Type 125: Obv. die 46a / Rev. die 39a
(Anokhin 1264 Ag)



Type 126: Obv. die 46a / Rev. die 40a
(Anokhin 753 Ag)

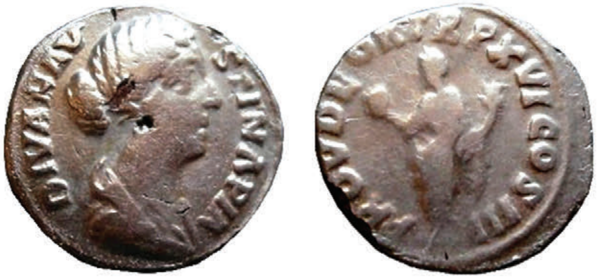


Type 127: Obv. die 47a / Rev. die 41a
(Anokhin 1452 Ag)

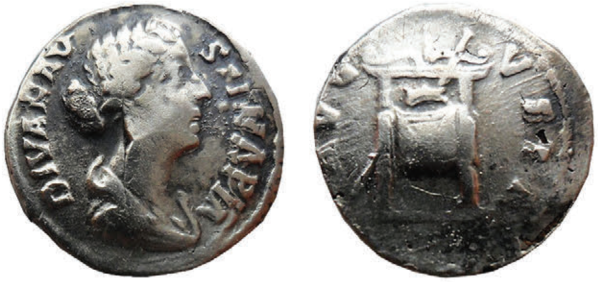


Type 128: Obv. die 48a / Rev. die 8c
(Anokhin 796 Ag)

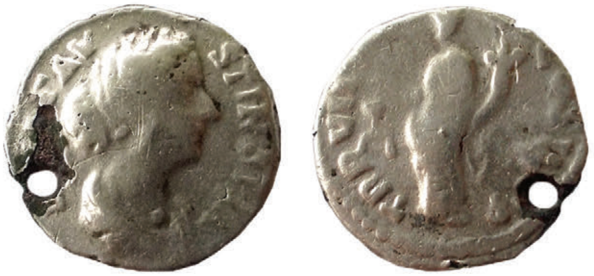
Not to scale, approximately 2:1



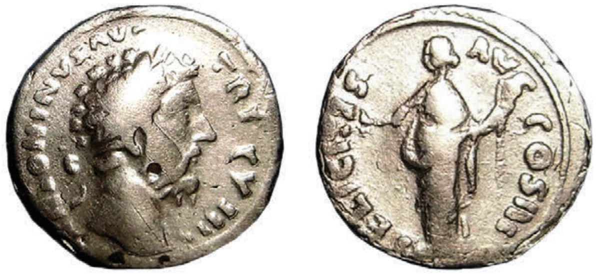
Type 129: Obv. die 49a / Rev. die 12a
(Anokhin 1066 Ag)



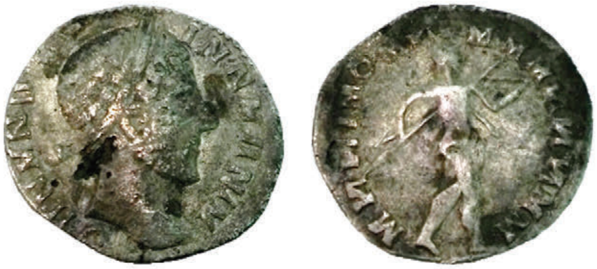
Type 130: Obv. die 49a / Rev. die 40a
(Anokhin 1065 Ag)



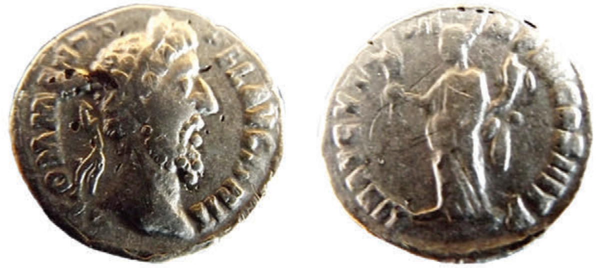
Type 131: Obv. die 50a / Rev. die 4a
(Anokhin 1177 Ag = Anokhin 1193 Ag)



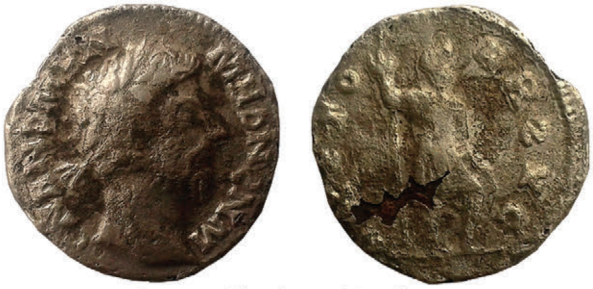
Type 132: Obv. die 51a / Rev. die 19a
(Anokhin 1044 Ag)



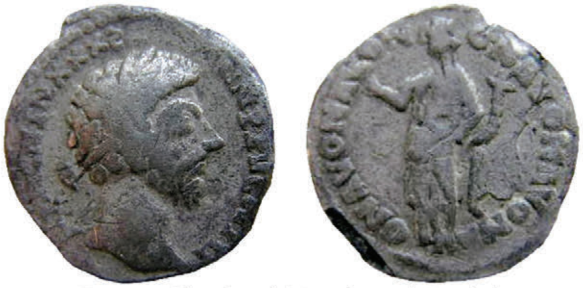
Type 133: Obv. die 52a / Rev. die 41a
(Anokhin 1521 Ag)



Type 134: Obv. die 53a / Rev. die 42a
(Anokhin 1093 Ag)

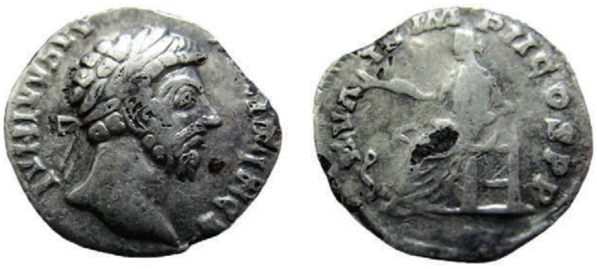


Type 135: Obv. die 54a / Rev. die 33a
(Anokhin 747 Ag)

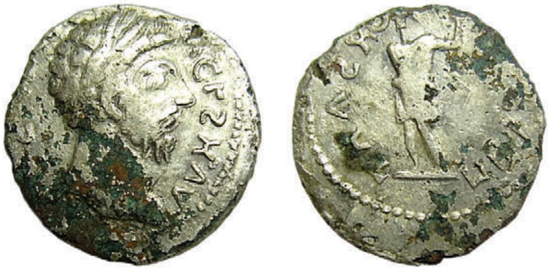


Type 136: Obv. die 54b / Rev. die 43a (+Punch 1)
(Anokhin 1355 Ag)

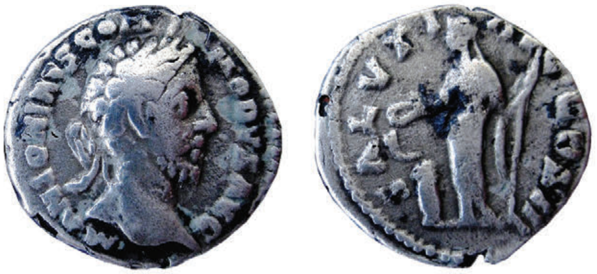
Not to scale, approximately 2:1



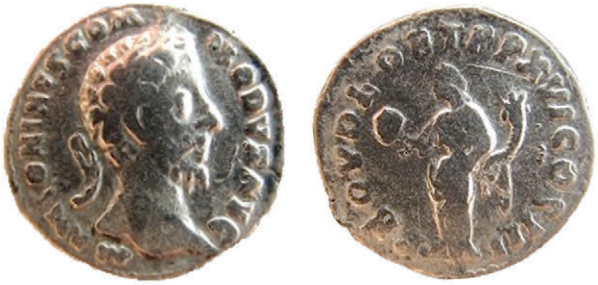
Type 137: Obv. die 54c / Rev. die 8c
(Anokhin 1277 Ag)



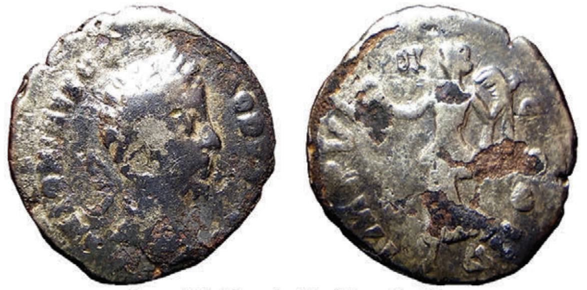
Type 138: Obv. die 54d / Rev. die 57a
(Anokhin 437 Ag)



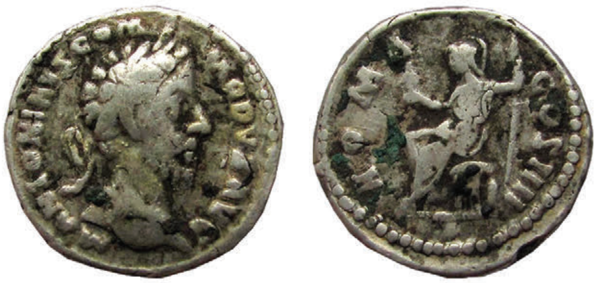
Type 139: Obv. die 55a / Rev. die 10a
(Anokhin 916 Ag)



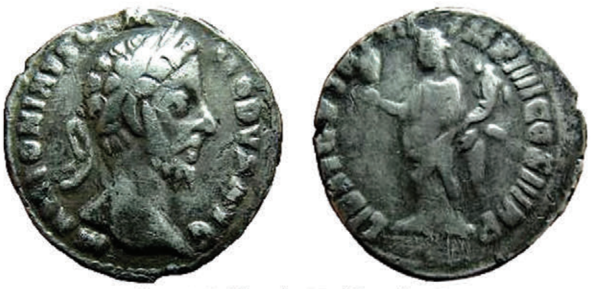
Type 140: Obv. die 55a / Rev. die 12a
(Anokhin 808 Ag)



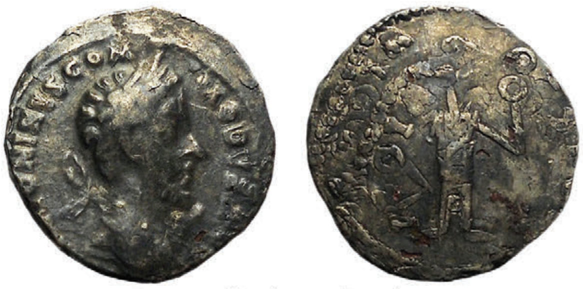
Type 141: Obv. die 55a / Rev. die 23a
(Anokhin 914 Ag)



Type 142: Obv. die 55a / Rev. die 30a
(Anokhin 915 Ag)

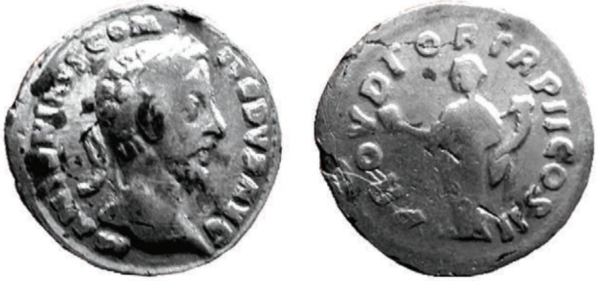


Type 143: Obv. die 55a / Rev. die 42a
(Anokhin 913 Ag)

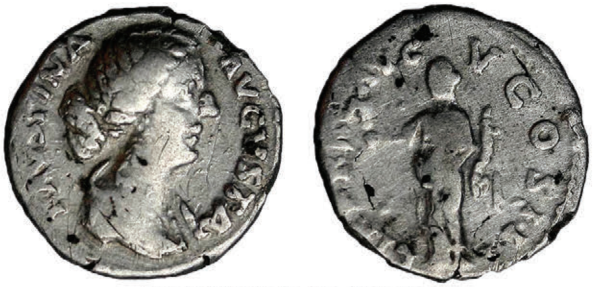


Type 144: Obv. die 55a / Rev. die 44a
(Anokhin 824 Ag)

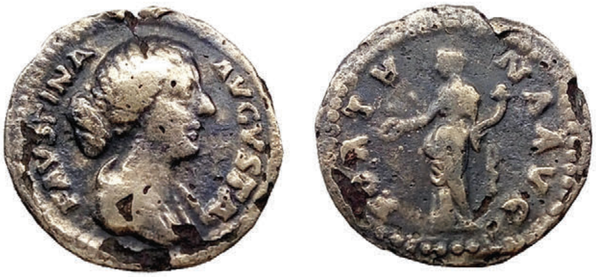
Not to scale, approximately 2:1



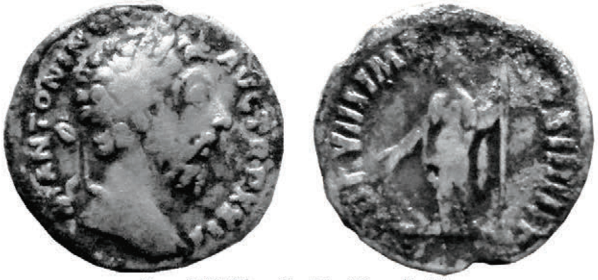
Type 145: Obv. die 55a / Rev. die 45a
(Anokhin 1079 Ag)



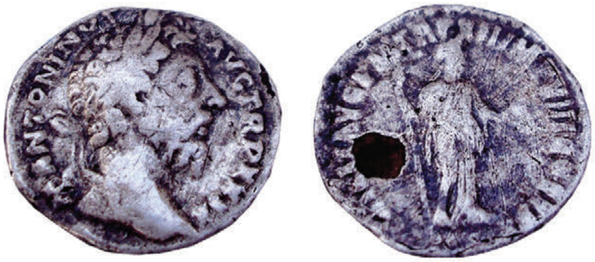
Type 146: Obv. die 56a / Rev. die 46a
(Anokhin 1562 Ag)



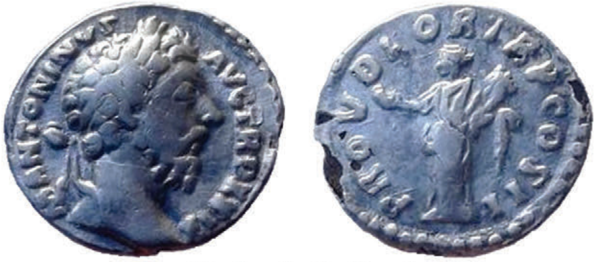
Type 147: Obv. die 56a / Rev. die 47a
(Anokhin 1326 Ag)



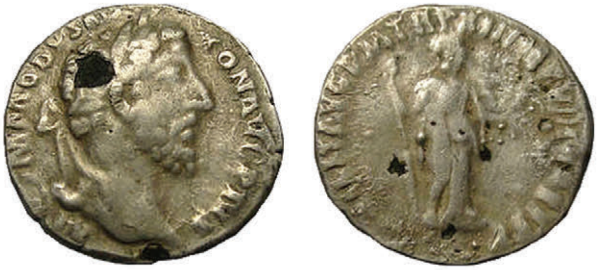
Type 148: Obv. die 57a / Rev. die 14a
(Anokhin 840 Ag)



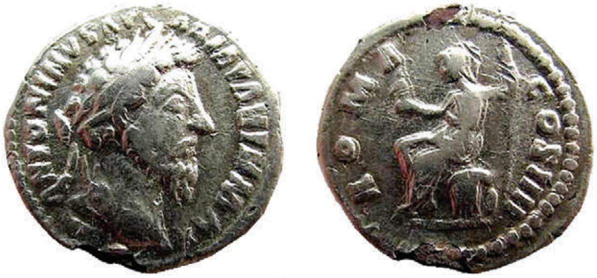
Type 149: Obv. die 57a / Rev. die 48a
(Anokhin 1069 Ag)



Type 150: Obv. die 57a / Rev. die 49a
(Anokhin 1139 Ag)

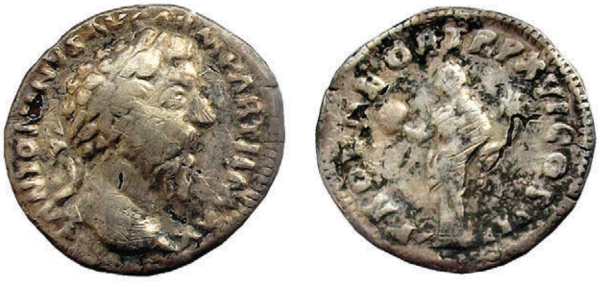


Type 151: Obv. die 58a / Rev. die 48a
(Anokhin 1291 Ag)

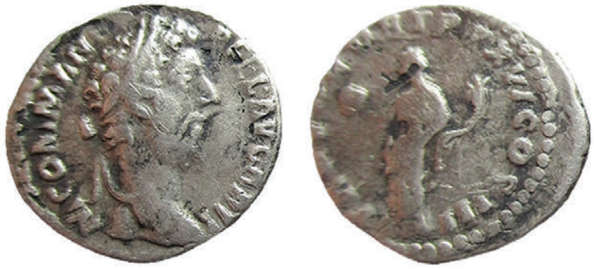


Type 152: Obv. die 59a / Rev. die 30a
(Anokhin 910 Ag)

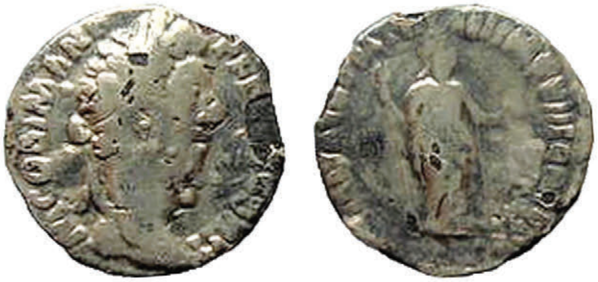
Not to scale, approximately 2:1



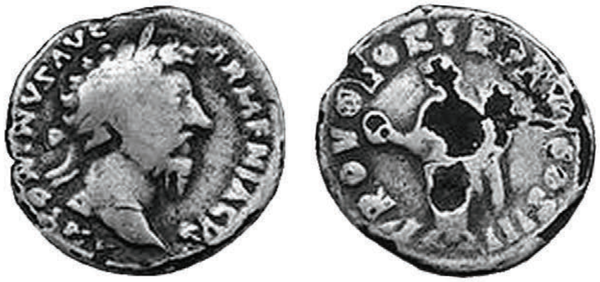
Type 153: Obv. die 59b / Rev. die 12a
(Anokhin 1136 Ag)



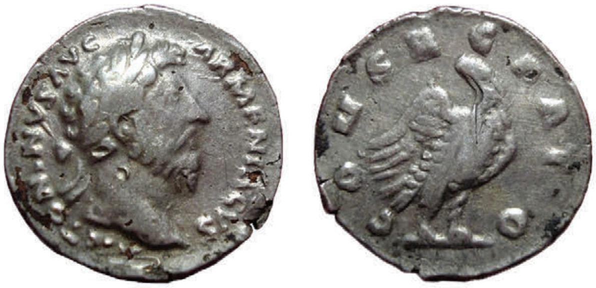
Type 154: Obv. die 60a / Rev. die 12a
(Anokhin 1510 Ag)



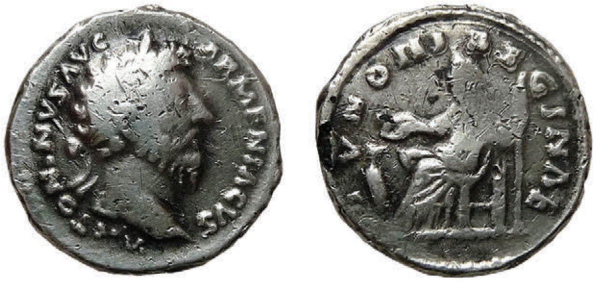
Type 155: Obv. die 60a / Rev. die 48a
(Anokhin 1070 Ag)



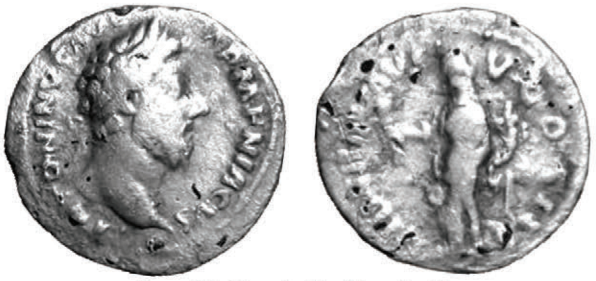
Type 156: Obv. die 61a / Rev. die 12a
(Anokhin 1449 Ag)



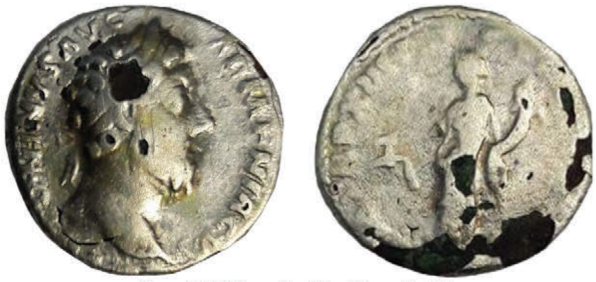
Type 157: Obv. die 61a / Rev. die 17a
(Anokhin 957 Ag)



Type 158: Obv. die 61a / Rev. die 36a
(Anokhin 1064 Ag)

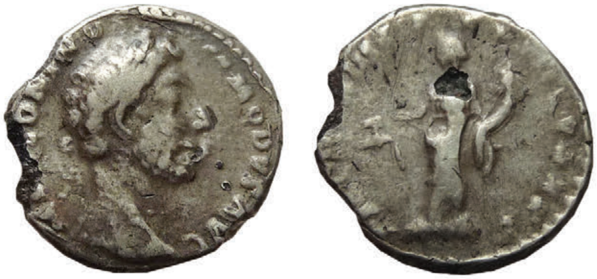


Type 159: Obv. die 61a / Rev. die 38a
(Anokhin 1148 Ag)

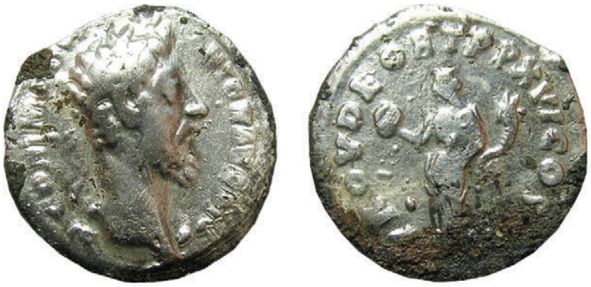


Type 160: Obv. die 61b / Rev. die 50a
(Anokhin 1559 Ag)

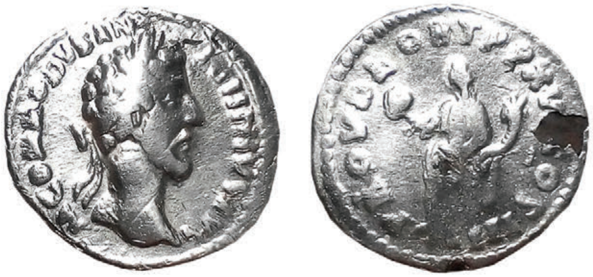
Not to scale, approximately 2:1



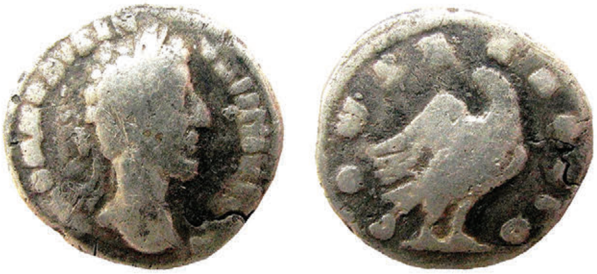
Type 161: Obv. die 62a / Rev. die 50a
(Anokhin 1568 Ag)



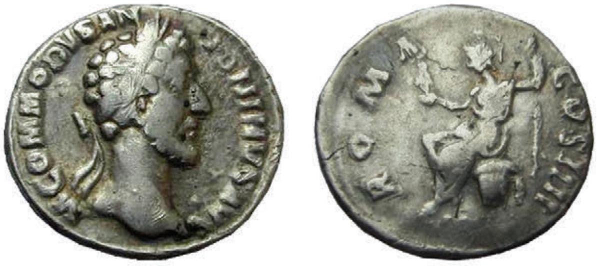
Type 162: Obv. die 63a / Rev. die 12a
(Anokhin 1534 Ag)



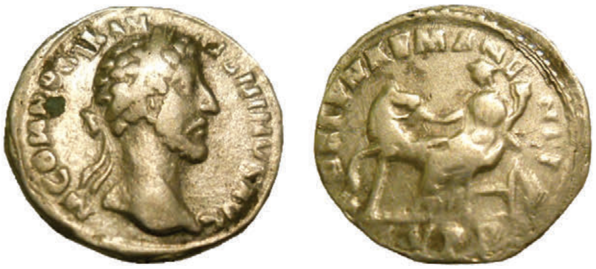
Type 163: Obv. die 64a / Rev. die 12a
(Anokhin 1518 Ag)



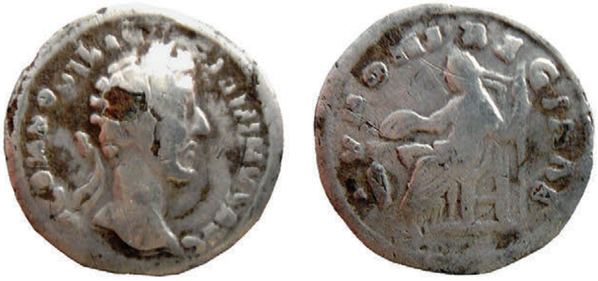
Type 164: Obv. die 64a / Rev. die 17a
(Anokhin 1128 Ag)



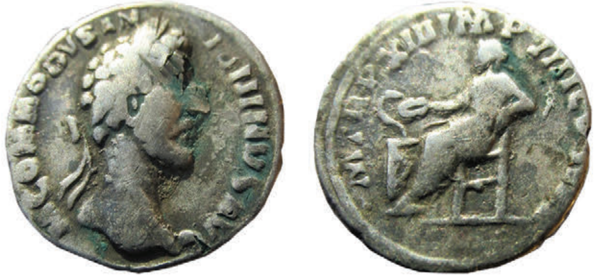
Type 165: Obv. die 64a / Rev. die 30a
(Anokhin 918 Ag)



Type 166: Obv. die 64a / Rev. die 31a
(Anokhin 1098 Ag)

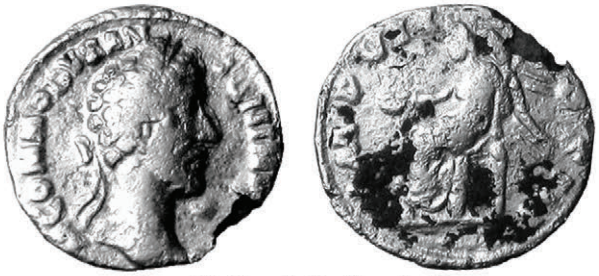


Type 167: Obv. die 64a / Rev. die 36a
(Anokhin 852 Ag)

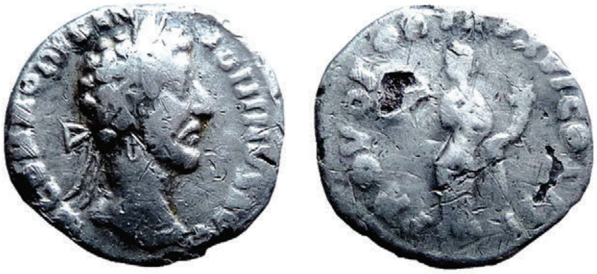


Type 168: Obv. die 64a / Rev. die 51a
(Anokhin 1129 Ag)

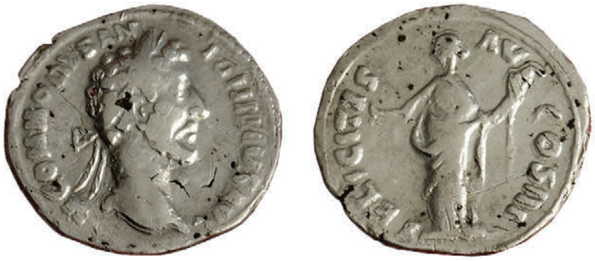
Not to scale, approximately 2:1



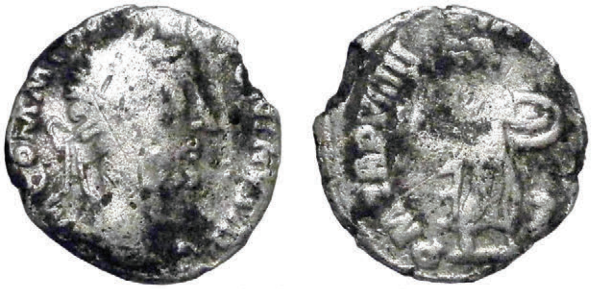
Type 169: Obv. die 64a / Rev. die 52a
(Anokhin 1349 Ag)



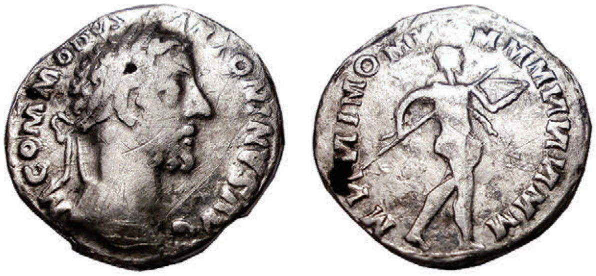
Type 170: Obv. die 64b / Rev. die 12a
(Anokhin 1048 Ag)



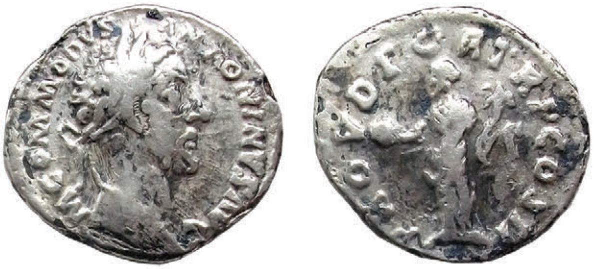
Type 171: Obv. die 64b / Rev. die 19a
(Anokhin 1451 Ag)



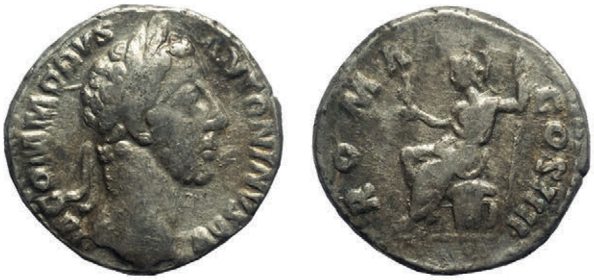
Type 172: Obv. die 65a / Rev. die 35a
(Anokhin 1430 Ag)



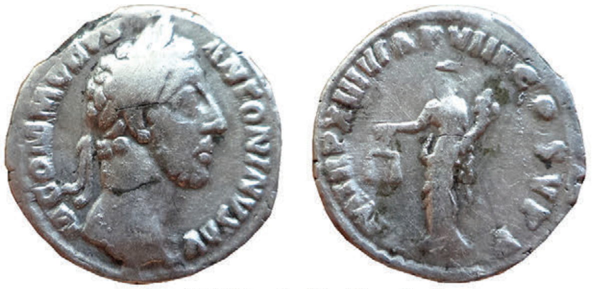
Type 173: Obv. die 65a / Rev. die 41a
(Anokhin 898 Ag)



Type 174: Obv. die 65a / Rev. die 53a
(Anokhin 1435 Ag)

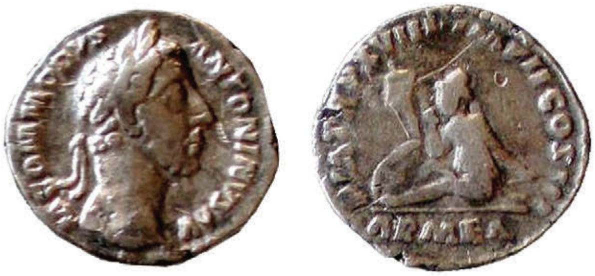


Type 175: Obv. die 66a / Rev. die 30a
(Anokhin 911 Ag)

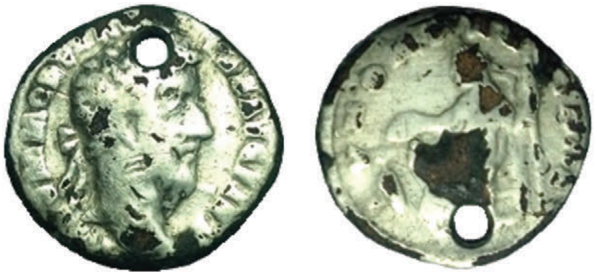


Type 176: Obv. die 66a / Rev. die 41a
(Anokhin 1229 Ag)

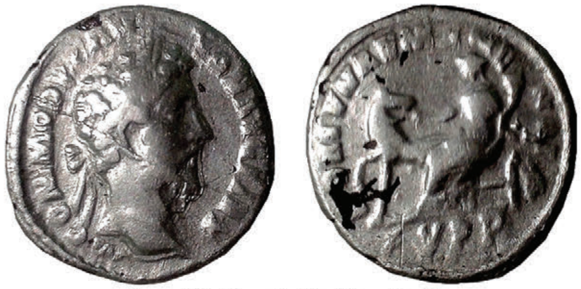
Not to scale, approximately 2:1



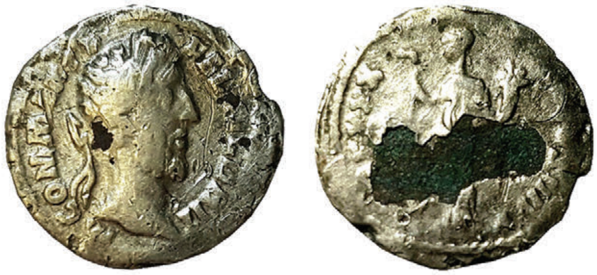
Type 177: Obv. die 66a / Rev. die 54a
(Anokhin 912 Ag)



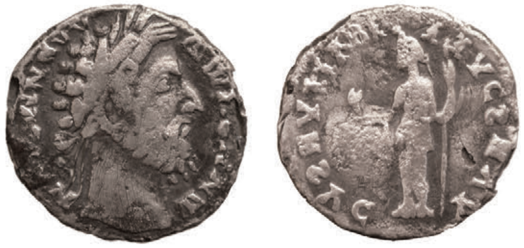
Type 178: Obv. die 67a / Rev. die 36a
(Anokhin 929 Ag)



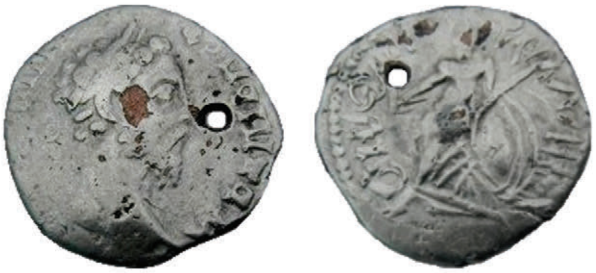
Type 179: Obv. die 67a / Rev. die 31a
(Anokhin 1080 Ag)



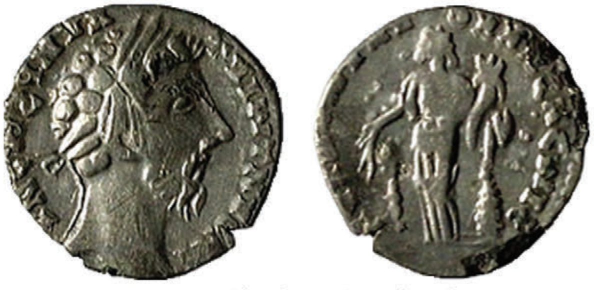
Type 180: Obv. die 68a / Rev. die 29a
(Anokhin 1274 Ag)



Type 181: Obv. die 69a / Rev. die 58a
(not listed by Anokhin)



Type 182: Obv. die 70a / Rev. die 56a
(Anokhin 576 Ag)



Type 183: Obv. die 71a / Rev. die 16b
(Anokhin 851 Ag)

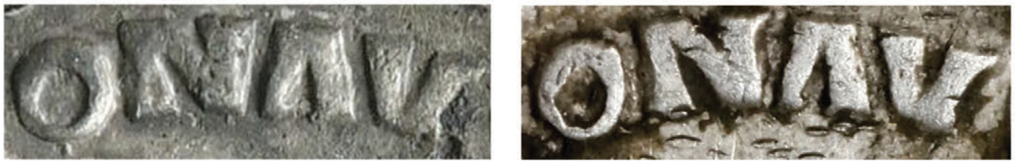
Photos:
- type nos.: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 19, 20, 21, 22, 23, 24, 25, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 60. 61, 62, 63, 64, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 79, 80, 81, 82, 83, 85, 86. 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 158, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 182, 183 – from Anokhin's database (© University of Warsaw);
- type nos.: 18, 59, 65, 78, 84, 181 – by Arkadiusz Dymowski;
- type nos.: 26, 116 – Savoca Numismatic Auctions (http://www.savoca-coins.com)

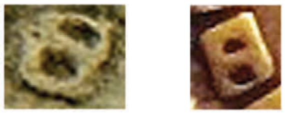
Not to scale, approximately 2:1

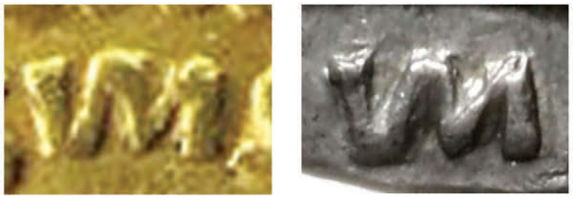
CATALOGUE

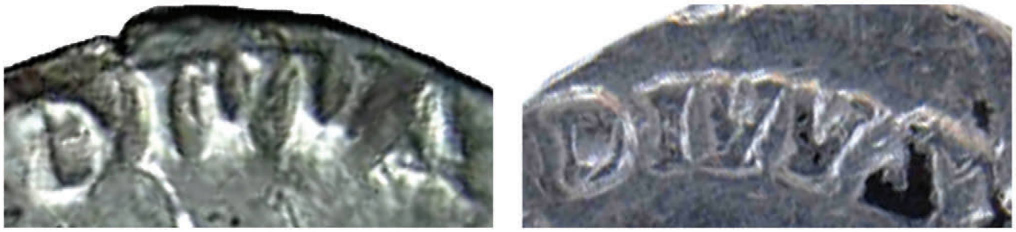
Part II.

List of identified punches used to produce coin dies of the ONAV Group


Punch 1


Punch 2


Punch 3


Punch 4

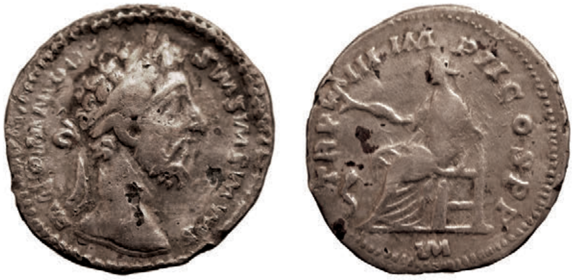
Photos: Anokhin's database (© University of Warsaw)
Not to scale

CATALOGUE

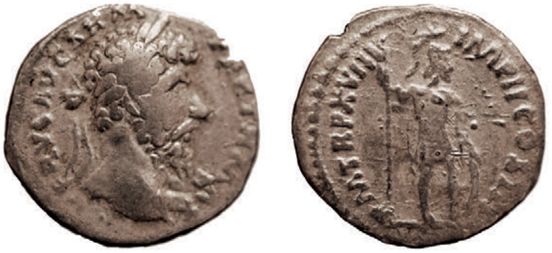
Part III.

Avaliable Metrological Data of the Onav Group Coins

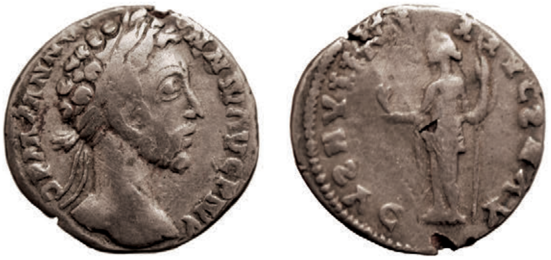
1) Coins examined by A. Dymowski (provenance of coins unknown)



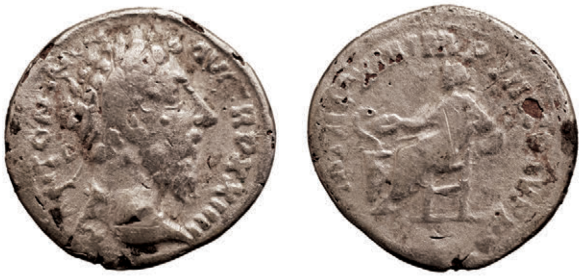
Weight: 2.23 g
Diameter: 18 mm
Axis: 10h
Subaeratus
Coin type (within the ONAV Group): 11
Coin from a private collection in Poland (described by A. Dymowski from the original)
Photo: A. Dymowski



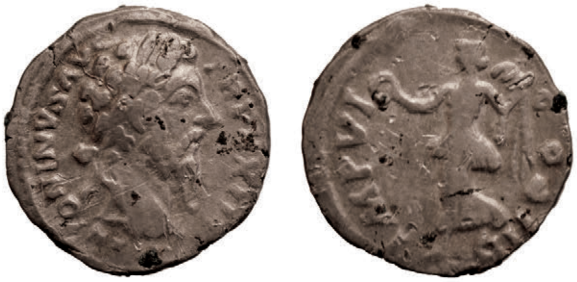
Weight: 2.40 g
Diameter: 17 mm
Axis: 11h
Subaeratus
Coin type (within the ONAV Group): 18
Coin from a private collection in Poland (described by A. Dymowski from the original)
Photo: A. Dymowski



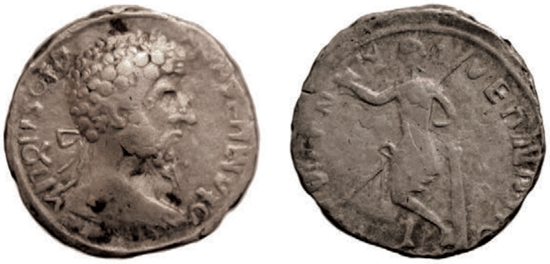
Weight: 2.25 g
Diameter: 17 mm
Axis: 6h
Subaeratus
Coin type (within the ONAV Group): 59
Coin from a private collection in Poland (described by A. Dymowski from the original)
Photo: A. Dymowski



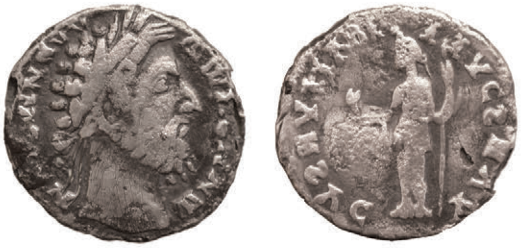
Weight: 2.76 g
Diameter: 18 mm
Axis: 1h
Subaeratus
Coin type (within the ONAV Group): 65
Coin from a private collection in Poland (described by A. Dymowski from the original)
Photo: A. Dymowski



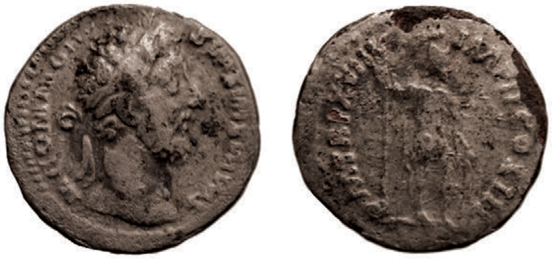
Weight: 2.49 g
Diameter: 18 mm
Axis: 12h
Subaeratus
Coin type (within the ONAV Group): 78
Coin from a private collection in Poland
(described by A. Dymowski from the original)
Photo: A. Dymowski



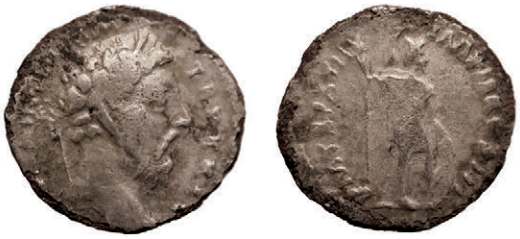
Weight: 3.13 g
Diameter: 17 mm
Axis: 12h
Coin made of uniform metal (?) – silver (?)
Coin type (within the ONAV Group): 84
Coin from a private collection in Poland
(described by A. Dymowski from the original)
Photo: A. Dymowski



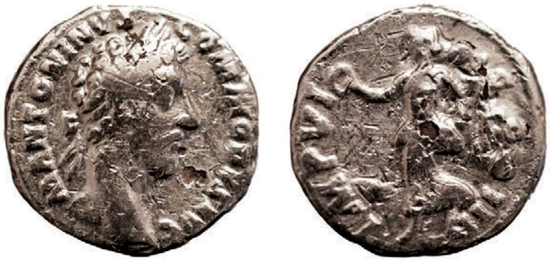
Weight: 1.71 g
Diameter: 16 mm
Axis: 6h
Subaeratus
Coin type (within the ONAV Group): 181
Coin from a private collection in Poland
(described by A. Dymowski from the original)
Photo: A. Dymowski



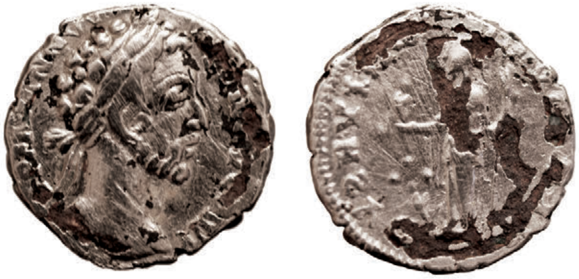
Weight: 2.47 g
Diameter: 17 mm
Axis: 12h
Subaeratus
Coin type (within the ONAV Group): 12
Coin from a private collection in Poland
(described by A. Dymowski from the original)
Photo: A. Dymowski



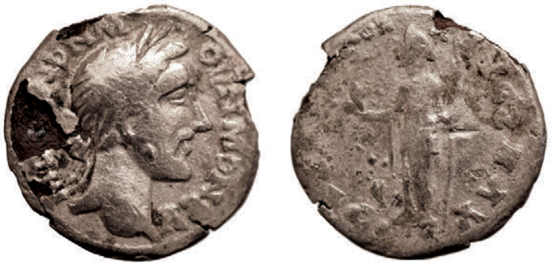
Weight: 2.27 g
Diameter: 16 mm
Axis: 1h
Subaeratus
Coin type (within the ONAV Group): 36
Coin from a private collection in Poland
(described by A. Dymowski from the original)
Photo: A. Dymowski



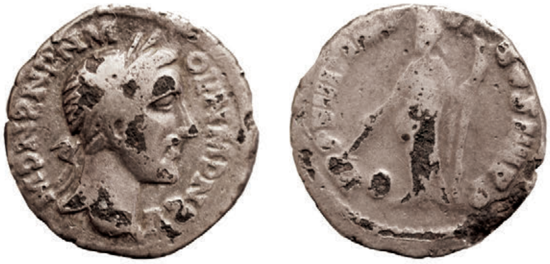
Weight: 2.41 g
Diameter: 17 mm
Axis: 6h
Subaeratus
Coin type (within the ONAV Group): 44
Coin from a private collection in Poland
(described by A. Dymowski from the original)
Photo: A. Dymowski



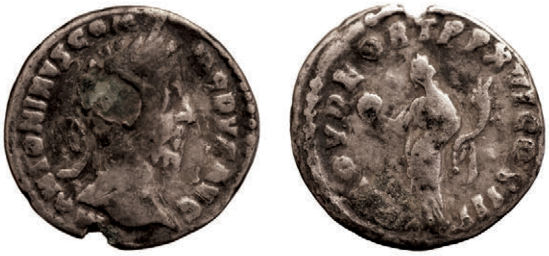
Weight: 2.58 g
Diameter: 18 mm
Axis: 6h
Subaeratus
Coin type (within the ONAV Group): 59
Coin from a private collection in Poland
(described by A. Dymowski from the original)
Photo: A. Dymowski



Weight: 2.22 g
Diameter: 17 mm
Axis: 12h
Subaeratus
Coin type (within the ONAV Group): 107
Coin from a private collection in Poland
(described by A. Dymowski from the original)
Photo: A. Dymowski

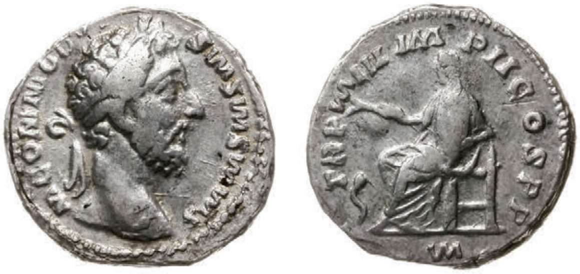


Weight: 2.43 g
Diameter: 17 mm
Axis: 12h
Subaeratus
Coin type (within the ONAV Group): 108
Coin from a private collection in Poland
(described by A. Dymowski from the original)
Photo: A. Dymowski

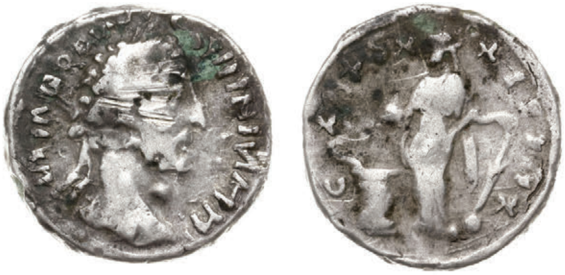


Weight: 1.39 g
Diameter: 17 mm
Axis: 6h
Subaeratus
Coin type (within the ONAV Group): 140
Coin from a private collection in Poland
(described by A. Dymowski from the original)
Photo: A. Dymowski

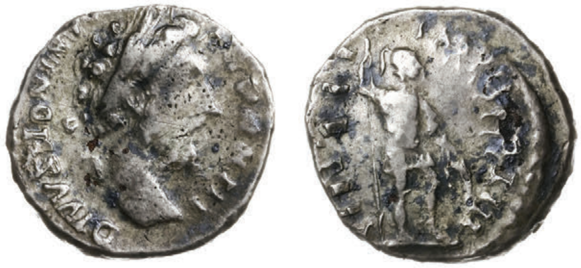
2) Coins offered on coin auctions (provenance of coins unknown)



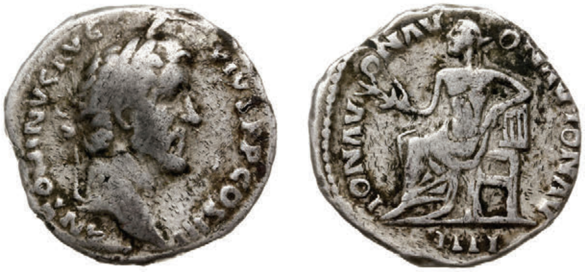
Weight: 1.97 g
Diameter: 18 mm
Material not described
Coin type (within the ONAV Group): 11
Coin from the Warszawskie Centrum
Numizmatyczne on-line auction:
lot no. 179802, 2019.
Photo: Warszawskie Centrum Numizmatyczne
(https://wcn.pl/)



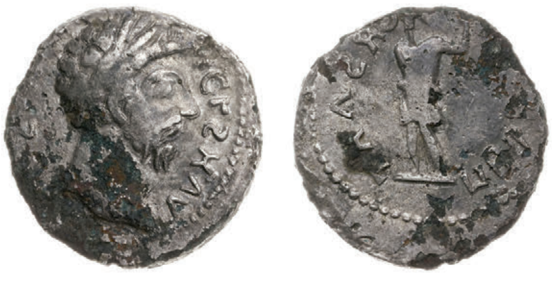
Weight: 2.86 g
Diameter: 17.8 mm
Described as silver
Coin type (within the ONAV Group): 22
Coin from the Warszawskie Centrum
Numizmatyczne on-line auction:
lot no. 196774, 2020.
Photo: Warszawskie Centrum Numizmatyczne
(https://wcn.pl/)



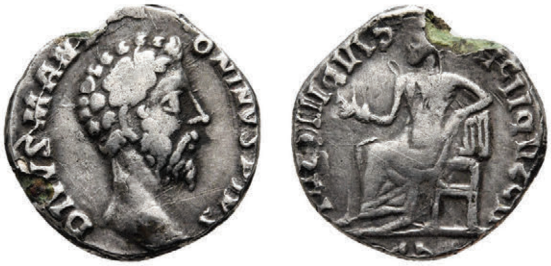
Weight: 2.23 g
Diameter: not described
Described as silver
Coin type (within the ONAV Group): 35
Coin from the Warszawskie Centrum
Numizmatyczne on-line auction:
lot no. 188362, 2019.
Photo: Warszawskie Centrum Numizmatyczne
(https://wcn.pl/)



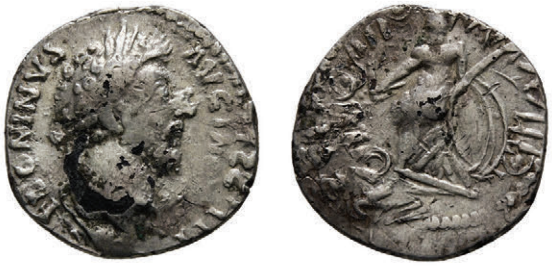
Weight: 2.32 g
Diameter: 18.2 mm
Described as silver
Coin type (within the ONAV Group): 86
Coin from the Warszawskie Centrum
Numizmatyczne on-line auction:
lot no. 196779, 2020.
Photo: Warszawskie Centrum Numizmatyczne
(https://wcn.pl/)



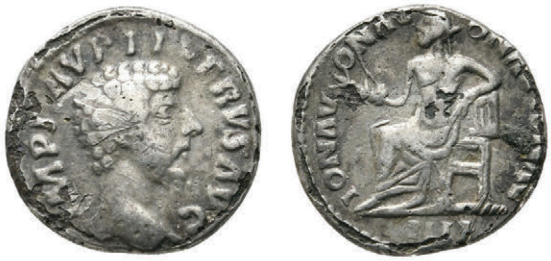
Weight: 2.41 g
Diameter: 17.4 mm
Described as plated bronze
Coin type (within the ONAV Group): 138
Coin from the Warszawskie Centrum
Numizmatyczne on-line auction:
lot no. 196777, 2020.
Photo: Warszawskie Centrum Numizmatyczne
(https://wcn.pl/)



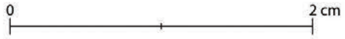
Weight: 1.82 g
Diameter: 17 mm
Described as fourrée
Coin type (within the ONAV Group): 14
Coin from the Savoca Numismatik 28th Blue Auction, lot no. 8, 2020.
Photo: Savoca Numismatic Auctions (http://www.savoca-coins.com)



Weight: 1.90 g
Diameter: 17 mm
Described as fourrée
Coin type (within the ONAV Group): 26
Coin from the Savoca Numismatik 81th Blue Auction, lot no. 11, 2020.
Photo: Savoca Numismatic Auctions (http://www.savoca-coins.com)



Weight: 2.37 g
Diameter: 17 mm
Described as fourrée
Coin type (within the ONAV Group): 116
Coin from the Savoca Numismatik 21th Blue Auction, lot no. 13, 2019.
Photo: Savoca Numismatic Auctions (http://www.savoca-coins.com)



JAROSŁAW BODZEK, SZYMON JELLONEK, AND BARBARA ZAJĄC

6. Finds of Counterfeit Roman Denarii at Selected Roman-Period Settlement Sites in Western Lesser Poland

The State of Research and Prospects

ABSTRACT In recent decades, the number of archaeological excavations and surveys conducted at Roman-period sites in various regions of Poland, including western Lesser Poland, has increased significantly. These studies concern, *inter alia*, numerous settlement sites. Intensive, not always legal, exploration activities are also conducted by the so-called detectorists. Among the numerous finds of portable artefacts registered during regular research and illegal searches, monetary finds are distinguished by their number. Numerous finds of Roman coins have also been registered in settlement sites in western Lesser Poland, including especially first–third-century AD denarii, but also their counterfeits, such as *denarii subaerati* and *denarii flati*, as well as imitations. This article analyses finds of counterfeit Roman denarii made in several Roman-period settlements located in western Lesser Poland. First of all, the monetary finds from the Przeworsk culture settlement in Jakuszowice, Kazimierza Wielka county (site 2) were verified. All the finds from Jakuszowice were examined with a fluorescence X-ray spectrometer (Spectro-MIDEX type), which made it possible to distinguish a greater number of counterfeit denarii (thirty-four items) than in previous publications. The article also provides a short review of monetary finds from Roman-period settlements in Nieprowice, Boronice, Aleksandrowice, Modlniczka, and Mysławczyce.

KEYWORDS Roman coin finds, counterfeits, cast copies, *denarii subaerati*, *denarii flati*, Lesser Poland, Jakuszowice

Introduction

In recent years, the amount of archaeological research conducted at Roman-period sites in various regions of Poland, including the area of western Lesser Poland, has increased significantly (cf. for example Bodzek 2015; Bodzek and Tunia 2020; Bodzek and Dobrzańska 2014; Dulęba and Romanowski 2018).[1] This has provided

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[1] The authors would like to thank Professor Judyta Rodzińska-Nowak from the Department of Iron Age Archaeology of the Institute of Archaeology, Jagiellonian University for agreeing

Jarosław Bodzek Jagiellonian University in Krakow

Szymon Jellonek University of Warsaw

Barbara Zając National Museum in Krakow

Counterfeits, Imitations, and Copies of Roman Imperial Denarii: Making and Faking Coins on Both Sides of the Limes, ed. by Arkadiusz Dymowski and Kyrylo Myzgin, WSA, 8 (Turnhout, 2024), pp. 109–133. This is an open access chapter made available under a CC BY-NC 4.0 International Licence.

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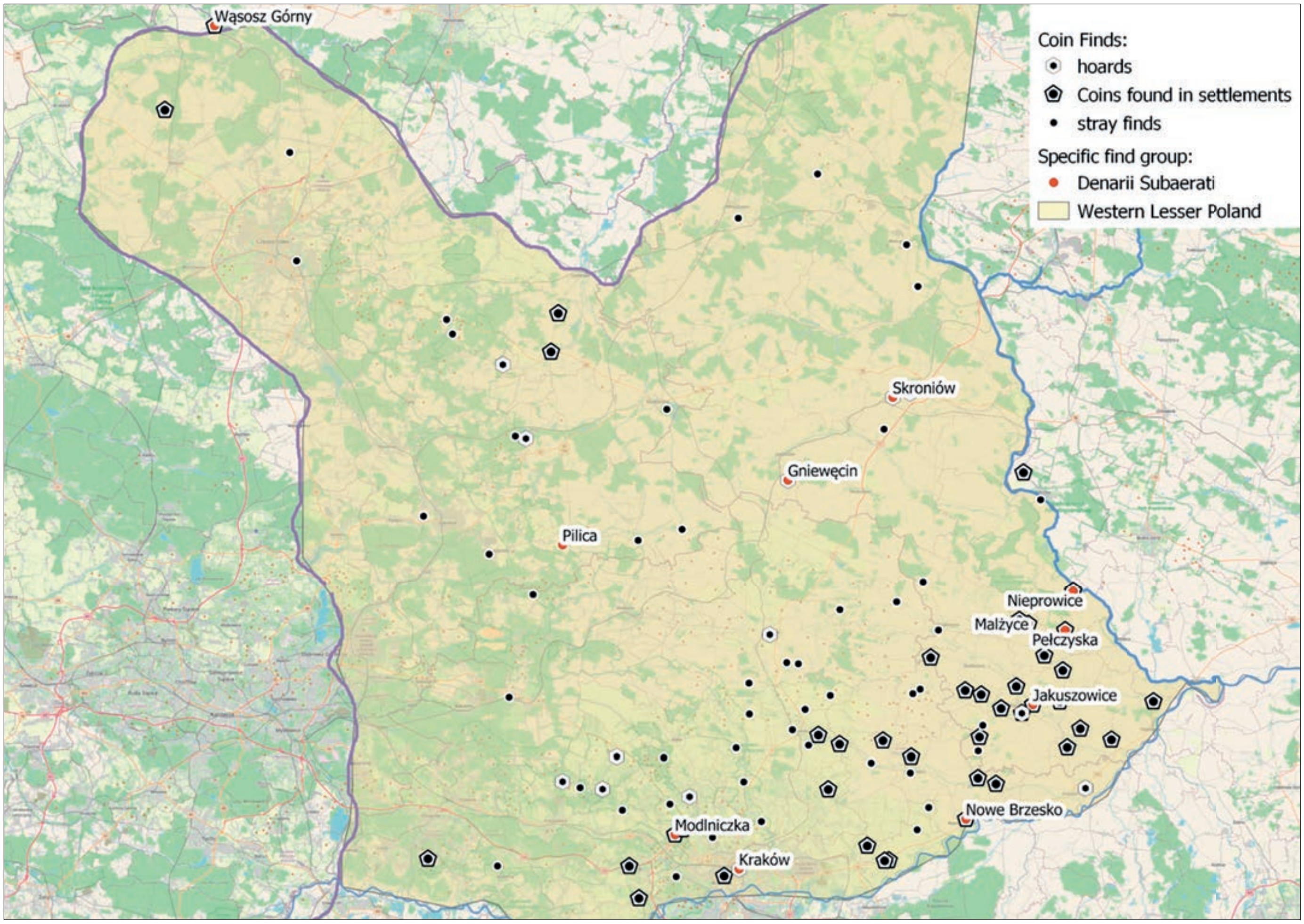
DOI 10.1484/M.WSA-EB.5.141511


Wąsosz Górny
Coin Finds:
hoards
Coins found in settlements
stray finds
Specific find group:
Denarii Subaerati
Western Lesser Poland
Skroniów
Gniewęcin
Pilica
Nieprowice
Małżyce
Pełczyska
Jakuszowice
Nowe Brzesko
Modlniczka
Kraków

Map 6.1. Coin finds from western Lesser Poland (map by S. Jellonek).

a lot of new and valuable information, among other things, regarding finds of Roman coins, including their counterfeits and imitations. The following text analyses, in terms of the presence of irregular Roman coins, i.e. various types of forgery, finds from several western Lesser Poland sites, mainly Jakuszowice, Kazimierza Wielka county but for example also Boronice, Kazimierza Wielka county, as well as Nieprowice, Pińczów county.[2]

The term western Lesser Poland in this study is understood as an area covering a part of the Małopolskie voivodeship north of the Vistula River and Świętokrzyskie voivodeship west of the Nida River (Map 6.1). The western and northern borders of the region of interest to us were adopted in relation to the borders of historically understood Lesser Poland, similarly to the inventories of Andrzej Kunisz (1969; 1985), thus partially covering the area of the present Silesian and Łódź voivodeships. In other words, it is an area that partially covers the Lesser Poland Upland and the border between the Nida basin and the Miechów Upland.

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to the analysis of coins from the research in Jakuszowice, and Dr Joanna Zagórska-Telega for her help in this matter. Jerzy Kliś, MA, for providing information about some of the finds. We would like to thank Prof. Marcin Biborski and Mr Mateusz Biborski from the Institute of Archaeology of the Jagiellonian University for their help in metallographic research of coins from Jakuszowice. Finally we thank Dr Kyrylo Myzgin from the University of Warsaw and Mr Jan Bulas from the Arch Foundation for extremely valuable remarks and comments on the first version of this text. All errors and shortcomings remain solely with us.

[2] In this article, we will not discuss in detail the circulation, meaning, or production of Roman silver and gold imitation coins. This is a separate issue. They will only be referred to briefly if the context requires it.

The region in question was heavily populated in prehistoric and protohistoric times (Rydzewski 1986, 124–96). Therefore, the relatively high number of archaeological sites is not surprising. During the Roman period, western Lesser Poland was inhabited by the Przeworsk culture population (Kaczanowski and Kozłowski 1998, 279; Kaczanowski and others 2017, 11; Dymowski and Myzgin 2021, 195–96). Especially high settlement density is visible in the southern part of the discussed area (Map 6.1). Two main factors seem to be responsible for this. On the one hand, this area is known for its very fertile soil that obviously attracts settlers (Rydzewski 1986, 169). On the other hand, the area in question is in the vicinity of Krakow, i.e. close to a significant research centre, grouping several important archaeological entities that naturally focus their research on the fertile loess highlands, which are rich in multi-period sites. In this case, intensive investment activity in the vicinity of Krakow, forcing archaeological rescue research, is of less importance. Thus, to some extent, the higher density of settlement may result from the state of research. In addition, it is worth noting that this area is characterized by a significant number of Roman coin finds in Roman-period settlements.

An important site due to eleven seasons of regular archaeological research (1982–1991; 1995–1997), which resulted, among other things, in the discovery of numerous Roman coins (109 exemplars) is Jakuszowice, Kazimierza Wielka county (Morawiecki 1984; Kunisz 1985, 262 no. 340, I–IX; 1996, 41–44; Bursche 1997a; 1997b; Kaczanowski and Margos 2002, 72 no. 218; Bodzek 2021, 34). Another seven coins were found later (finds registered in 2012 during regular archaeological research and remote finds made by detectorists; cf. Rudnicki 2014, nos 1–4; Bodzek 2021, 34). That is why this settlement has so far been considered an absolutely unique site for the Przeworsk culture. However, recent discoveries at other settlements from the Roman period, including Nieprowice and Pełczyska (Pinczów county) and Boronice (Kazimierza Wielka county) seem to show that Jakuszowice may not be as unique as previously assumed (Bodzek 2021; in our view, the problem of the importance of the Roman- and Migration-period settlement in Jakuszowice requires further research). Therefore, further archaeological research in this region is needed to better identify this problem.

State of Research

The issue of Roman coin counterfeiting has a rich literature. This is especially true in the case of the territory of the Roman Empire.[3] On the other hand, the problem of counterfeiting Roman coins in the European Barbaricum has not been fully researched and discussed so far.[4] However, some important works on this subject should be mentioned. Andrzej Kunisz (1996, 19–30) was the first to raise the topic of imitation and forgery in the article entitled 'Studies on the Finds of Roman Coins in Poland during the Past Three Decades. A Tentative Approach'. Then Aleksander Bursche (1997b, 31–42) published an article about *denarii subaerati* from the settlement in Jakuszowice. This article enlivened the discussion on subaerati in the Central European Barbaricum, especially in the Przeworsk and Wielbark cultures. However, only relatively recently has there been interest in the problem of other forgeries. Significant observations in this matter were made by Przemysław Dulęba and Andrzej Romanowski (2018, 61–99), on the basis of finds from Nieprowice. Jarosław Bodzek and Krzysztof Tunia (2020) presented a few comments on the findings of this type of forgery in Boronice. In order to understand the phenomenon of counterfeiting denarii in the Barbaricum, new finds from the area occupied by the Chernyakhiv culture are of utmost importance. The phenomenon of counterfeiting and imitating Roman coins on a massive scale in the territory of today's Ukraine and Moldova was demonstrated by Oleh Anokhin (2015). Research on the production of forgeries in the Chernyakhiv culture area has also been carried out by Oleksandr Nadvirnyak, Oleh Pohorilets, and Kyrylo Myzgin (Nadvirnyak and Pohorilets 2018; 2019; 2020; Myzgin 2019, 37; Myzgin and Kodats'kyi 2020). Finds of forgeries from Belarus were presented by Vital Sidarovich (2017, 124–41). Finally, Arkadiusz Dymowski (2019b, 149–81; 2020, 167–78; 2021, 111–16) made an important contribution to the issue of the presence of imitations and counterfeits of Roman coins in the European Barbaricum understood as a whole. He is also working on this issue with Kyrylo Myzgin, who collected the latest data on finds of this type from Ukraine. The result of this cooperation are two subsequent articles published by them in this volume.

This relatively recently awakened interest in the problems of counterfeits and imitations has, of course, increased interest in irregular coins among researchers studying monetary finds. However, such finds also had to be listed earlier, largely unrecognized and mistakenly classified as regular denarii (for example, Jakuszowice

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[3] A brief overview of the state of research, including older literature, can be found in Awianowicz and others 2022, 129–36. The aforementioned work also contains an analysis of written sources regarding forgeries of Roman coins.

[4] Cf. short, though not intended as a complete presentation of the literature on the subject, discussion of selected publications in Awianowicz and others 2022, 136–41; Dymowski 2021, 111.

— on the basis of current research, thirty-four forgeries were identified, previously twenty-seven such coins were identified). Unfortunately, many coins discovered before WWII, but also later, are now elusive, and therefore it is not possible to verify them again. Therefore, in this text we will focus on coins that were discovered relatively recently.

Denarii subaerati, *denarii flati*, and Imitations

Over fifty finds of irregular Roman coins known as counterfeits or imitations have been discovered in the area. Until recently, all counterfeits of denarii were collectively referred to as *denarii subaerati*, i.e. bronze core coins covered with a thin layer of silver (Dymowski 2020, 170; Bodzek and Tunia 2020, 154). Currently, other types of counterfeit are also recognized (see Dymowski 2021, where types of counterfeiting are also discussed). First of all, forgeries made of base metals (usually a copper-tin alloy or a copper-tin-lead alloy), which, thanks to a similar colour, imitated official denarii. Among them, *denarii flati*, i.e. cast copies of denarii, can be marked.[5] Similarly, one can describe the counterfeits of double denarii as *antoniniani flati*, also known among finds at Roman-period settlements in western Lesser Poland. The terminology is still under discussion, however, in our text we will consistently use the term *denarii flati* for cast copies of Roman denarii and *antoniniani flati* for cast antoniniani counterfeits.[6] Unfortunately, the poor condition of many of the coins often makes it difficult to identify them properly. It should be mentioned that the subaerati core itself without a silver coating can be viewed as a cast. Therefore, the description should be very accurate. Metallurgical research should also be considered necessary. In the case of this article, this was carried out on coins from the research in Jakuszowice.

Another category are the barbaric imitations made of silver or gold, or gold- or silver-plated.[7] These imitations, styled on Roman coins, were produced in the Barbaricum area (cf. Degler 2015; Dymowski 2017, 114–15; 2019a, 182–83; Dymowski and Myzgin 2021, 200 — imitations and copies in this case). At this point, mention should be made of silver imitations from Kostkowice and Malkowice, which were part of the hoards (Morawiecki 2004, 629; Dymowski 2007, 57 no. 25; 2011, 212 no. Mp38: 870; 2019b, 167 nos 21, 27; Czernek 2013, 147–48, 153). However, these hoards have not been discovered in the settlements, so they are not subject to further consideration. It is worth noting the discovery of a barbarian imitation in the Przeworsk culture settlement in Skowronno Dolne (Czernek 2013, 143–54), located on the eastern bank of the Nida River, and therefore beyond the area we are interested in. So far, no finds of such silver imitations have been recorded in settlements from the Roman and Migrations periods located in the area of western Lesser Poland. Hence, we will not deal with them in the following parts of this text.

Context of Finds

For a full understanding of the phenomenon of counterfeits and imitations of Roman denarii in Barbaricum, the context of such finds is important. Of course, from a scholarly point of view, the most valuable are coins discovered during regular, well-conducted archaeological research, when the exact stratigraphic (context/layer) and planigraphic location of the finds are known. Unfortunately, few of the imitations and falsifications in question have been discovered in the course of such research. As already mentioned, the largest number of finds were recorded during works in the settlement in Jakuszowice, site 2 (Godłowski 1986a; 1986b; 1991; 1992; Godłowski and Rodzińska-Nowak 1995; Bursche and others 2000; Kaczanowski and Rodzińska-Nowak 2010a; 2010b). Archaeological research was also carried out in Pełczyska, Aleksandrowice, and Mysławczyce (Czernek 2013; Bodzek 2015; Dulęba and Romanowski

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[5] The term *denarii flati* was introduced into the scientific nomenclature by Kyrylo Myzgin, after consultations with the well-known classical philologist Bartosz Awianowicz. Myzgin used this term for the first time during the international seminar *Manufacturing and Use of Counterfeit Roman Imperial Denarii on Both Sides of the Limes. Cross-border Transfer of Ideas, Technologies, Coins, or Independent Phenomena?* (11–12 June 2021) in the paper 'Denarii flati. Cast copies of Roman denarii from Barbaricum'. Other scholars use different terminology for cast imitations of Roman denarii; see also Chapter 10 in this volume; cf. Peter 2008, 391; Dymowski 2020, 170–71. See also Dymowski 2021, where types of counterfeiting are also discussed.

[6] Adam Degler uses a term 'base metal issues' (2016, 15); Vital Sidarovich — cast 'denarii', Kyrylo Myzgin in an article by Vital Sidarovich — 'barbarian copies' (2017, 131 n. 19); Dulęba and Romanowski — imitations made of tin-lead bronzes (2018, 82); Dymowski and Myzgin — 'copy' (Dymowski 2021, 113). On the terminology used by other researchers, see Awianowicz and others 2022, 129–36.

[7] It is worth noting, however, that gold imitations in particular had a completely different function than forgeries, and also silver imitations of denarii. On golden, 'Gothic' imitations of Roman aurei circulating in the Central European Barbaricum cf. Więcek 2019; more literature there. This category of artifact is also a research issue of an ongoing project: *IMAGMA: Imagines maiestatis. Barbarian Coins, Elite Identities and the Birth of Europe*. A DFG/NCN Beethoven project directed by Aleksander Bursche; cf. Dymowski 2021, 113.

2018; Bodzek and Tunia 2020). More often, however, the finds are the result of non-invasive field prospecting conducted by archaeologists (Bulas 2016; Dulęba and Romanowski 2018; Bodzek and Tunia 2020). Recently, most coins have been obtained through amateur searches with the use of metal detectors. Unfortunately, a large part of them are searches without the permission of the proper archaeological authority, which since 2021 is subject to a fine and the penalty of restriction of liberty or imprisonment for up to two years (Polish Journal of Laws.2022.0.840, Art. 109c).[8]

Bearing this in mind, however, it is worth emphasizing that the number of forgery finds in the settlements of the Przeworsk culture in western Lesser Poland is relatively high. It should also be added that *denarii subaerati* are rarely part of hoards (Crawford 1968, 55–56; Bursche 1997b; Dymowski 2019b, 173; Dymowski and Myzgin 2021, 197, 205–07), which proves the skill of the Przeworsk culture population in recognizing defective coins and counterfeits (Dymowski 2020, 173). Nevertheless, the forgeries were used, probably in a different context, by people living in western Lesser Poland in antiquity, as evidenced by loose finds at Roman-period settlements (Dymowski and Myzgin 2021, 197). Apart from Jakuszowice, they were registered in Pełczyska (Pinczów county) (Rudnicki 2007, 107–08; Dulęba and Romanowski 2018, 77–78), Boronice (Kazimierza Wielka county) (Bodzek and Tunia 2020, 147–66), Aleksandrowice (Krakow county) (Bodzek 2015, 115–29; Dulęba and Romanowski 2018, 77, 81–82; Bodzek and Tunia 2020, 155), Nieprowice (Pinczów county) (Dulęba and Romanowski 2018, 61–99), Mysławczyce (Proszowice county) (Bodzek and Dobrzańska 2014, 303–15) as well as at Modlniczka (Krakow county) (Byrska-Fudali and Przybyła 2012, 537).

From a chronological point of view, the vast majority of forgeries are copies of coins minted in the second century AD (Fig. 6.1). Only two were modelled on previously issued denarii of Vespasian and Titus. However, in the case of the largest number, the prototypes were made in the times of Antoninus Pius. This is generally consistent with the influx of denarii into the Central European Barbaricum, the majority of which are those made during the reign of this ruler (Dymowski 2013; Dymowski and Myzgin 2014; cf. Dymowski and Myzgin 2021, 202–03). However, it is worth noting that the counterfeits modelled on Roman denarii from the first or second century could have been made much later (Bodzek and Tunia 2020; Dymowski 2020).

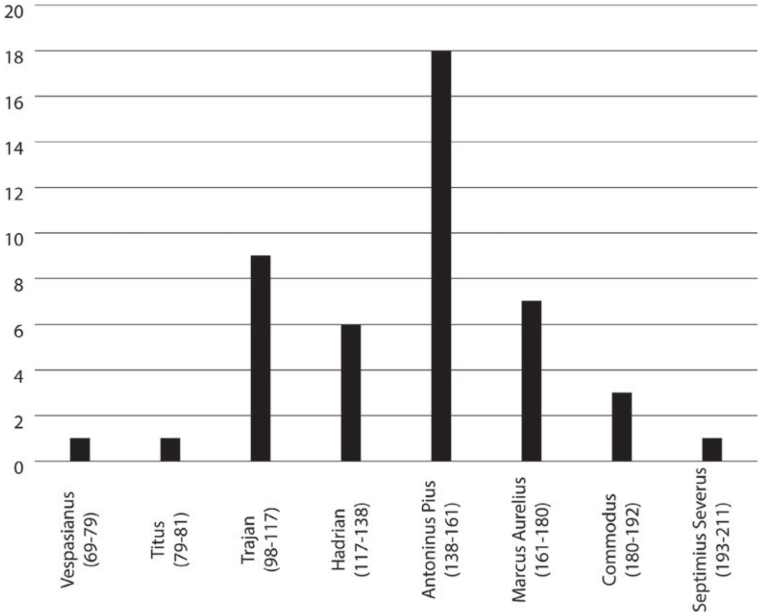

Figure 6.1. Chronological breakdown of counterfeits of Roman denarii found on settlements from the Roman period in western Lesser Poland (figure by B. Zając).

Coin Counterfeits from the Settlement in Jakuszowice

The settlement from which we have the largest number of finds of counterfeit Roman coins so far is the already mentioned Jakuszowice, Kazimierza Wielka county (Fig. 6.2). One of the reasons for the registration of such a large number of Roman coins and their copies at the site (116 coins in total) is the regularity of archaeological research conducted there in the years 1982–1991, 1995–1997, and then 2012 (Godłowski 1986a; 1986b; 1988; 1990; 1991; 1992; Godłowski and Rodzińska-Nowak 1995; Bursche and others 2000; Rudnicki 2014). However, most of the coins from this site were discovered during a surface prospection conducted using metal detectors. The 116 Roman coins found date from the late Republic to the reign of Valens (364–378) (Bursche 1997a; 1997b; Bursche and others 2000). The most frequent group among them (thirty-four copies) are counterfeits in the form of *denarii subaerati*. Among them, five subaerati were modelled on the coins of Trajan (98–117), two on those of Hadrian (117–138), ten on Antoninus Pius's issues, five on Marcus Aurelius (161–180), and two on Commodus (180–192) prototypes. The described forgeries were therefore based on prototypes from the second century, which were arriving in the area of the Barbaricum in large numbers. Three of them, the coins of Antoninus Pius, Marcus Aurelius, and Commodus, are pierced. Thus, they probably performed, at least for some time, a non-monetary function. It is worth emphasizing, however, that four other regular denarii discovered in the course of the conducted research are also pierced. Perhaps one of the coins described as *denarius subaeratus* is a hybrid, but its poor condition does not allow for the verification of this hypothesis. In addition, it should be noted that five coins also have signs of cutting, which may indicate a certain distrust of their recipients and checking the quality of the ore (Bursche 1997b; cf. Bursche 2008).

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[8] Legal status in 2022.

Aleksander Bursche in his article emphasized the poor condition of the coins, and in some cases the lack of silver coat. Before the publication of Bursche's article, only four coins had been analysed in terms of chemical composition, which allowed us to conclude that they were made of lead-tin bronze (Bursche 1997b; cf. Bursche 2008). For this reason, as well as due to the current growing interest in the issues of Roman coin counterfeits in ancient times, chemical analysis was carried out on the Jakuszowice items preserved in the collections of the Institute of Archaeology of the Jagiellonian University (105 coins). The analyses were performed in a Spectro-MIDEX X-ray fluorescence spectrometer with the energy dispersion and polarized excitation radiation with high detection values and a ppm-level sensitivity, located at the Archaeometallurgy and Historical Artefacts Restoration Workshop of the Institute of Archaeology, Jagiellonian University. The obtained results were developed in the TURBO QUANT analytical software, in the SPECTRO package, in the form of tables, with percentage shares for each particular element.

On the basis of the conducted research (Table 6.1), it can be concluded that among the coins from Jakuszowice there are more forgeries than expected. At this point, it should be emphasized that this type of analysis should be performed due to the fact that in many cases it is not possible to identify, on the basis of organoleptic analysis, whether we are dealing with the original or a well-made 'copy' of the coin. Thus, thirty-four of the tested Jakuszowice coins are forgeries, including *denarii subaerati* and *denarii flati*. The coins or their cores were made of a tin bronze alloy with a greater or lesser admixture of lead, and sometimes traces of silver.

The research results clearly indicate a marginal silver content (Ag 0.06–1.07) and a majority of copper (Cu) in thirty-two out of thirty-three coins (usually around 55–83 per cent). The only exception is the coin of Commodus minted during the reign of Marcus Aurelius (inv. no. 912/85), in which copper accounts for 32 per cent and tin (Sn) as much as 39 per cent. In other cases, tin also constitutes a significant percentage (usually 15–28 per cent). The third component is lead, the content of which is between 3 and 24 per cent in the aforementioned coin of Commodus. However, in most cases it ranges between 5 and 15 per cent. Thus, twenty-seven of the thirty-four coins are to be considered forgeries of denarii made of tin-lead bronzes. The remaining six coins contain 2–3 per cent lead and can therefore be described as being made of tin bronze. However, it should be noted that fluctuations in the alloy composition are significant among the studied coins. It is also worth adding that one of the coins contains as much as 8 per cent zinc (inv. no. W 2964/95).

Significant differentiation results from the differences in the initial material, which, depending on the hypothesis adopted, was melted down to cast or strike the counterfeits.

In the light of current research and discoveries, the place of production of both *denarii subaerati* and other types of counterfeit is puzzling. Michael Crawford made a conjecture about the production of subaerati at the mint in Rome (Crawford 1968, 55; cf. Bursche 1997b). The presence of workshops producing various types of forgery is also known from other regions of the Roman Empire (cf. Peter 1990; 2004; 2008; 2011). Moulds for the production of cast counterfeits modelled on specimens from the second and third centuries, were also discovered in what is now Belgium, France, Great Britain, Germany, Luxembourg, the Netherlands and Switzerland. These finds come mainly from the vicinity of the Roman limes (Raub and Zwicker 2012, 219–21). Finds of moulds for the production of cast copies of Roman denarii were also recorded in the areas of settlement of the Chernyakhiv culture. Their presence indicates the production of forgeries of this type by the population of Barbaricum, primarily by the people of the Chernyakhiv culture (Anokhin 2015, 11–13; Dymowski 2017, 116–17; Dymowski and Myzgin 2019). In the case of Jakuszowice, despite the examination, mainly on the surface, of approx. 11 ha, no workshops indicating the production forgeries in the area of the settlement have so far been registered. However, a metallurgical workshop related to the processing of iron and non-ferrous metals was discovered, where the denarii of Hadrian and Antoninus Pius were also found (Bursche and others 2000, 102, 107). Therefore, it can be assumed on this basis that the forgeries present in the Jakuszowice settlement, both subaerati and others, are imports or from other regions of the Barbaricum (Chernyakhiv culture) (Dymowski and Myzgin 2021, 208), or, from the territory of the Empire (a final resolution of this issue requires further research).

The chronology of the production of the counterfeit Roman denarii is also puzzling. In the case of the Jakuszowice specimens, most of them are finds discovered during surface prospecting, without any specific archaeological context, although a significant part of them is generally related to the excavations. Only a few copies have been discovered in contexts that can be dated to phases C1b–C2 (Bursche 1997a; 1997b; Bursche and others 2000). Due to the influx of Roman coins, mainly in the second half of the second and third centuries AD (Dymowski 2013; Dymowski and Myzgin 2014), presumably their production should be dated mainly to the third century, and perhaps even to its second half (Bodzek and Tunia 2020; Dymowski 2020). Counterfeit Roman coins could circulate for a very long time, as they are found in coin deposits from the fourth and fifth centuries (e.g. Kroczyce Okupne, Silesian voivodeship; Lengerich, North Rhine-Westphalia; Smørenge and Sorte Muld, Bornholm) (Dymowski and Myzgin 2021, 206). Their influx into the settlement in Jakuszowice could therefore have occurred in the third century or later. Ancillary evidence confirming such dating is the presence, among their finds from western Lesser Poland, also of coins counterfeiting antoniniani from the first half of the third century AD. Such coins are known from Boronice.

Other Settlements in Western Lesser Poland. The Comparative Analysis

Finds of Roman coins, although not as numerous as in the case of the settlement in Jakuszowice, were also registered at other sites in western Lesser Poland. It is therefore worth considering whether the forgeries also occurred in other settlements in this region. The publications of finds from Nieprowice, Boronice, Pełczyska, Aleksandrowice, Mysławczyce, and Modlniczka were taken into account.

In the settlement in Nieprowice, Pińczów county, thirty-three coins minted from the times of the Republic to the times of Aurelian (270–275) were obtained as a result of surface prospecting. Among them are three *denarii flati* of tin-lead bronze, the prototypes of which were the coins of Hadrian, Antoninus Pius, and Marcus Aurelius, as well as four *denarii subaerati* based on those of Trajan, two by Antoninus Pius and Septimius Severus (193–211). Subaerati of the last emperor are not among the numerous finds in western Lesser Poland. Among the coins found at the site that are not counterfeit, two are pierced, while the denarius of Antoninus Pius has traces of cutting (Dulęba and Romanowski 2018).

Another settlement with frequent finds of Roman coins is Boronice, Kazimierza Wielka county. So far, thirty-five coin finds have been registered at the site, discovered as a result of surface prospecting or found randomly. They are dated from the time of Otho (69) to Trajan Decius (249–251). Among them, there are five forgeries made of tin-lead or of tin bronze. Apart from forgeries of denarii, the site also yielded counterfeits of antoniniani. Part of the material is still being researched. There are forgeries of coins of Titus (79–81), Trajan, Hadrian, Antoninus Pius, and Marcus Aurelius. Among original Roman coins one exemplar, i.e. Antoninus Pius's denarius, is pierced (Bodzek and Tunia 2020).

Less numerous finds of Roman coins are known from the settlements in Pełczyska, Mysławczyce, Aleksandrowice, and Modlniczka. Archaeological research was carried out at the above-mentioned sites, however, some metal artefacts, including coins, were obtained from the surface survey using a metal detector. In Pełczyska, Pińczów county, at least twenty-two coins have been discovered, minted since the time of the Republic till the reign of Constantine I (306–337). Four of them are subaerati, the prototypes of which are Vespasian (69–79) for Domitian (81–96) (one), Hadrian (one), and Antoninus Pius (two) denarii. The finds in terms of chronology and structure are similar to the set of coins found at Jakuszowice. Only two coins have been discovered with a clearer archaeological context. One of them, the Marcus Aurelius denarius, was found in a late Roman clay structure (furnace?) (Rudnicki 2007, 105).

In Modlniczka, Krakow county, eight Roman coins were discovered. They were minted from the time of Vespasian to Septimius Severus. Two coins are *denarii subaerati* modelled on the prototypes struck by Antoninus Pius for Faustina the Younger and by Commodus (Kaczanowski and others 2017, 85).

At Mysławczyce, Proszowice county, there are ten coins registered, dated from the times of Vespasian to Claudius II (268–270), with two coins being subaerati, the prototypes of which are the coins of Trajan and Antoninus Pius. The coin modelled on the prototype of Trajan's denarius has survived only as a copper anima. Most of the coins come from surface prospection. At the site, a structure was discovered (building 93/94) interpreted as a bronzer's workshop, where a Claudius II antoninianus was found (Kaczanowski and others 2017, 310).

In Aleksandrowice, Krakow county, eight coins were discovered, two of which are *denarii flati* modelled on the coin of Trajan as well as the one of Hadrian minted for Antoninus Pius (Bodzek 2015, 117). Both coins were analysed for their chemical composition. The coin modelled on Trajan's denarius was made of tin bronze (47.8 per cent Cu, 42.8 per cent Sn, 2.7 per cent Pb, 0.23 per cent Ag), while the Hadrian piece was made of tin-lead bronze (33 per cent Cu, 36, 9 per cent Sn, 19.4 per cent Pb). Both coins were discovered in archaeological contexts. A copy of a Trajan coin was found in the fill of object 1080, a columnar structure dated to phase C1b. The second coin was discovered in object 550, one of the original postholes of the former building, dating from phase C2 (Bodzek 2015, 120, 122). It is also worth paying attention to object 1079, in which the coin of Trajan was found, as well as fragments of crucibles for the production of bronze. Late Roman ceramics and terra sigillata from Severus's times were also discovered in the filling (Bodzek 2015, 122).

Summary

In many sites we have a similar situation in terms of the structure of monetary finds. Findings of counterfeit Roman denarii at settlements in western Lesser Poland also fit into the pattern. In the case of the above-mentioned sites, they account for approx. 20 per cent of coin finds, but it should be emphasized that the percentage may change due to new research, as well as the increasing number of finds. It is also worth noting that there are other sites in this region with some coin finds, such as Opatkowice, Zagórzyce, or Czechy, where no counterfeits have been registered so far.[9]

One of the most important aspects of the discussed issue is the production of *denarii subaerati* and *denarii flati*. Perhaps the forgeries may come from the mint in Rome, other regions of the Roman Empire, or from the Barbaricum area. For this reason, more comprehensive research should be carried out, not only of the counterfeits themselves, but also of their archaeological context, as well as verification of artefacts of other categories.

The first- and second-century AD denarii probably arrived in the western Lesser Poland settlements at the end of the second and the beginning of the third centuries AD, and their forgeries later, probably mainly in the later third century AD. Some of the coins were discovered in contexts dated to the C1b–C2 phases, but most of them came from surface prospection without a more precise archaeological context, that would allow for more accurate dating or determination of their functions. Counterfeit coins, like their prototypes at least partially, could have performed financial or other functions on the premises of the Barbaricum. Some of them are pierced and could therefore be used as pendants, for example (Bursche 2008, 395–416).

It is also worth emphasizing that on several coins from various settlements, including those from Jakuszowice and Nieprowice, there are traces of cuts, which may also indicate a certain distrust on the part of the inhabitants, and thus the coins were checked for the bullion.

One of the research perspectives is the need to conduct metallographic tests that allow for the recognition of counterfeits. Currently, more and more analyses of this type are carried out by many numismatists and archaeologists. It is worth emphasizing that the research on the chemical composition will be primarily important for sites with more frequent coin finds. In addition, archaeologists, who are not always able to identify counterfeit items among the original coins, should also be encouraged to make a more detailed analysis of coins.

An important postulate is also the need to define various types of forgeries. In previous studies, these types of coins were referred to with the general term *denarii subaerati*. Recently, in connection with the expansion of knowledge on the repertoire of forgeries found in the Barbaricum, new terms have appeared, such as *denarii flati*, *antoniniani flati*, cast copies, etc., which require universal acceptance, so that it is possible to use specific concepts that are understandable to all in the future. As mentioned above, the authors of this text favour the use of the term *denarii flati*.

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[9] In the case of Zagórzyce, Kazimierza Wielka county, these are sites 1 and 2, which date back to the early Roman period. The research currently being conducted at site 3 (late Roman period) has yielded several more monetary finds, among which there may be forgeries of interest to us. However, the finds are still being researched.

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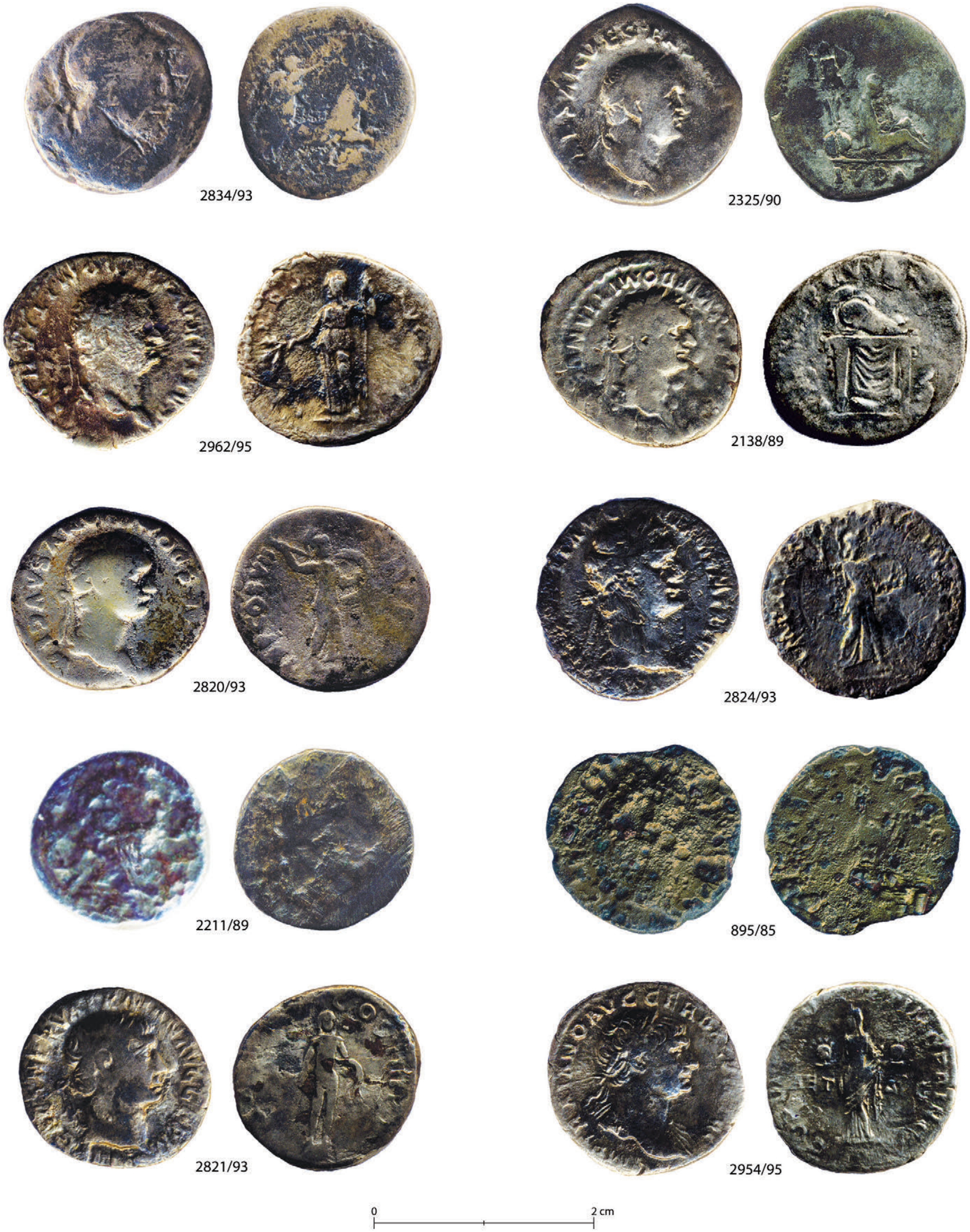

2834/93
2325/90
2962/95
2138/89
2820/93
2824/93
2211/89
895/85
2821/93
2954/95
0
2 cm

Figure 6.2a. Coin finds from the Jakuszowice, Kaziemierza Wielka county (photos by the authors).

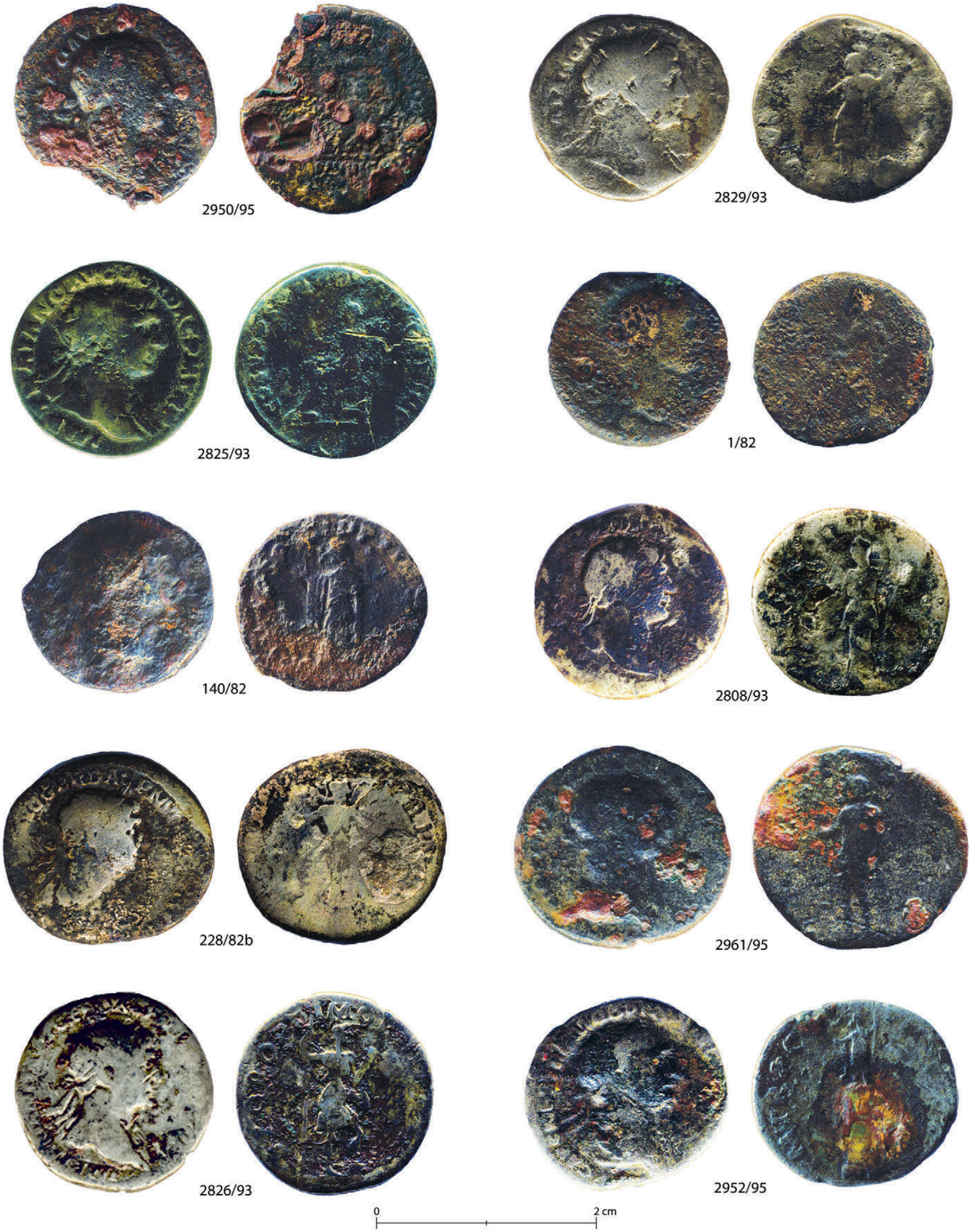
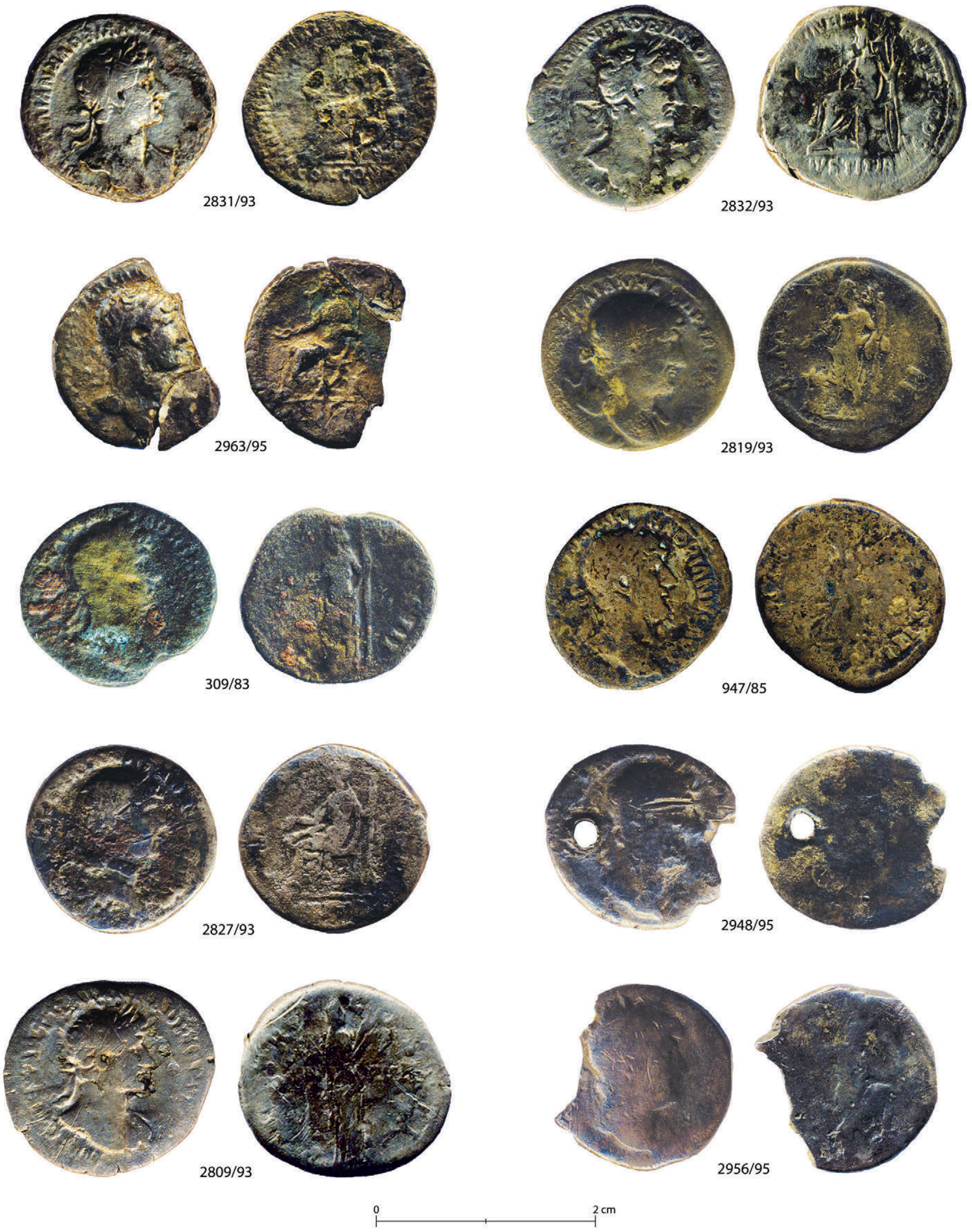

2950/95
2829/93
2825/93
1/82
140/82
2808/93
228/82b
2961/95
2826/93
2952/95
0
2 cm

Figure 6.2b. Coin finds from the Jakuszowice, Kaziemierza Wielka county (photos by the authors).



2831/93

2832/93

2963/95

2819/93

309/83

947/85

2827/93

2948/95

2809/93

2956/95

Figure 6.2c. Coin finds from the Jakuszowice, Kaziemierza Wielka county (photos by the authors).

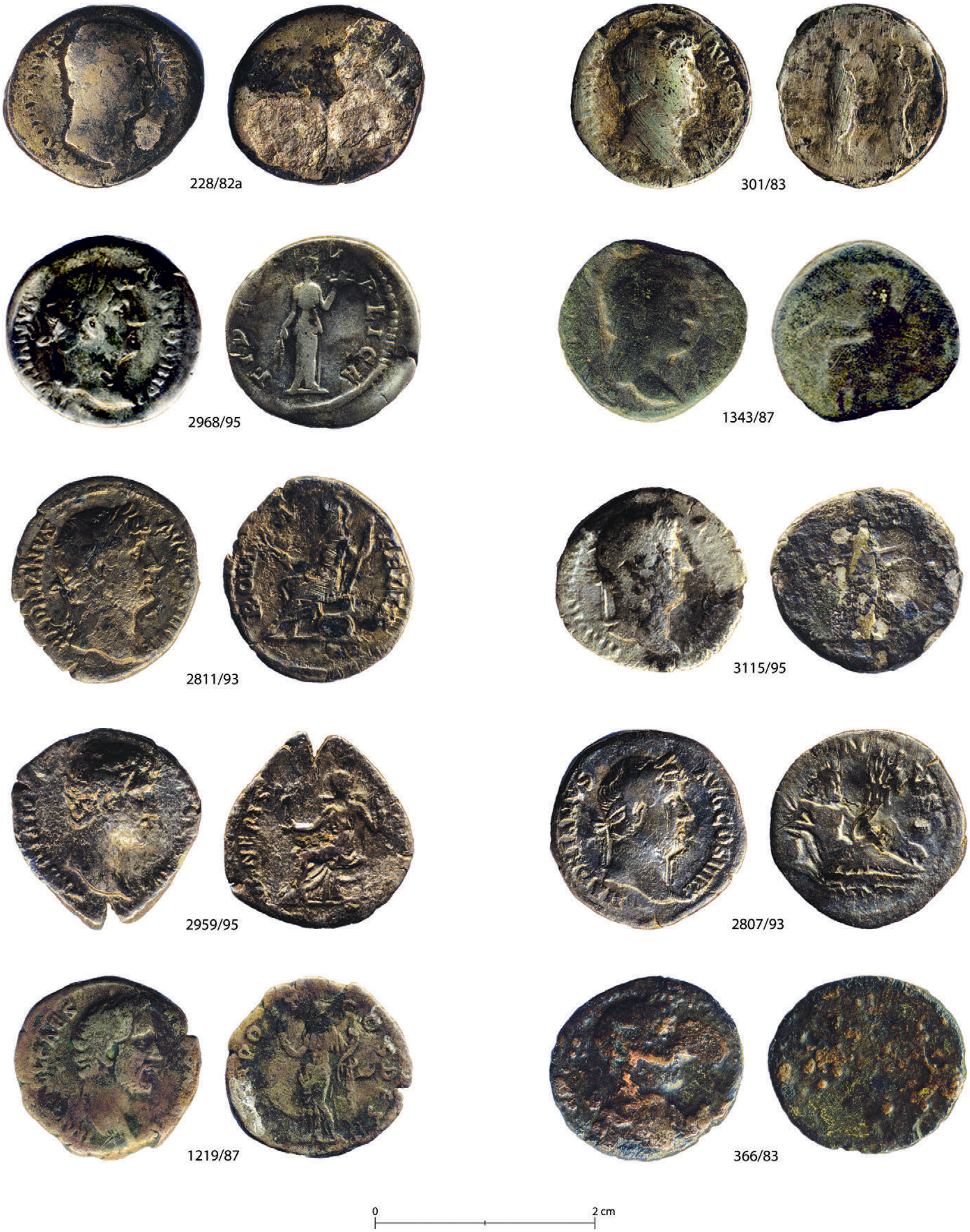

228/82a
301/83
2968/95
1343/87
2811/93
3115/95
2959/95
2807/93
1219/87
366/83
0
2 cm

Figure 6.2d. Coin finds from the Jakuszowice, Kaziemierza Wielka county (photos by the authors).

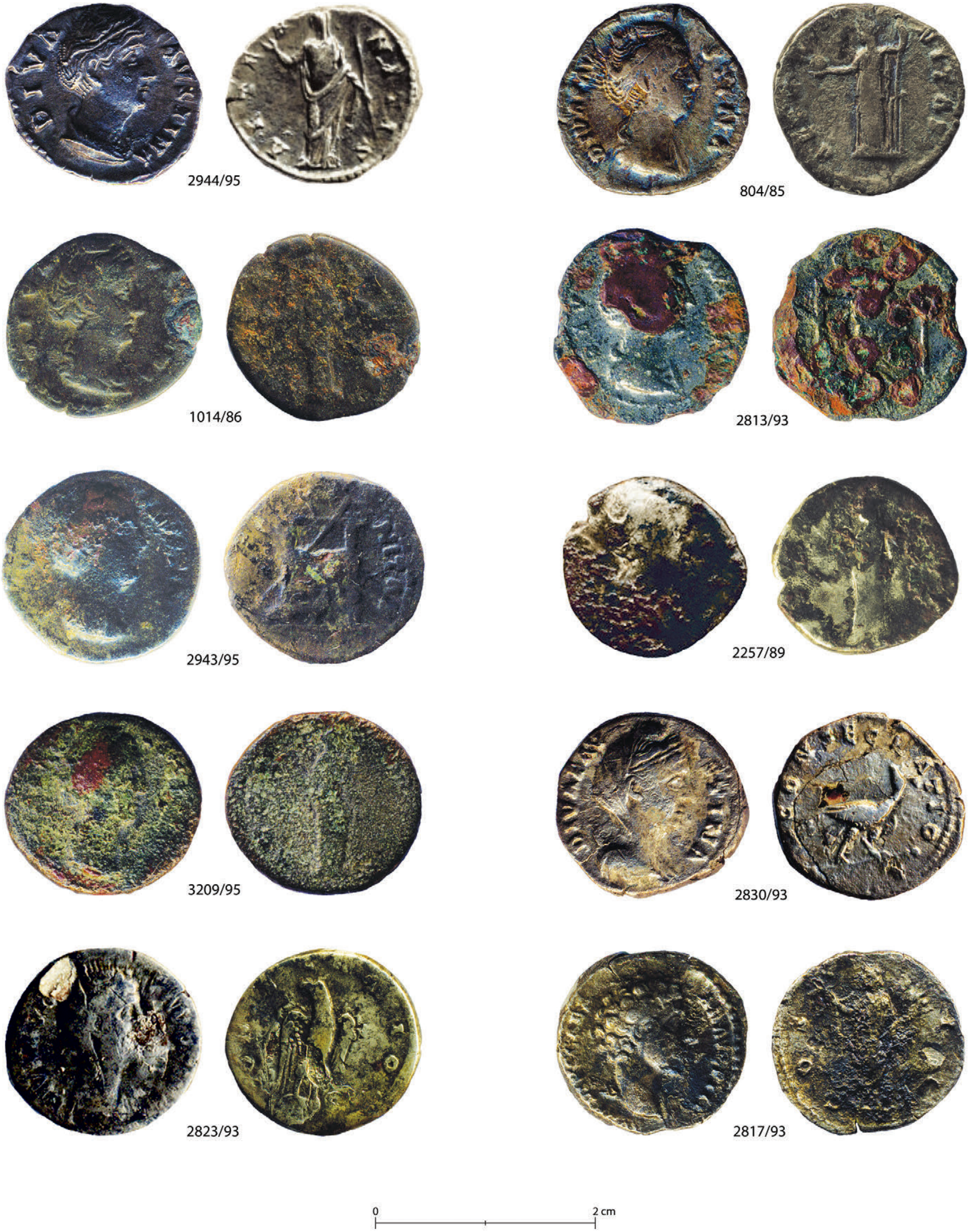

2944/95
804/85
1014/86
2813/93
2943/95
2257/89
3209/95
2830/93
2823/93
2817/93
0
2 cm

Figure 6.2e. Coin finds from the Jakuszowice, Kaziemierza Wielka county (photos by the authors).

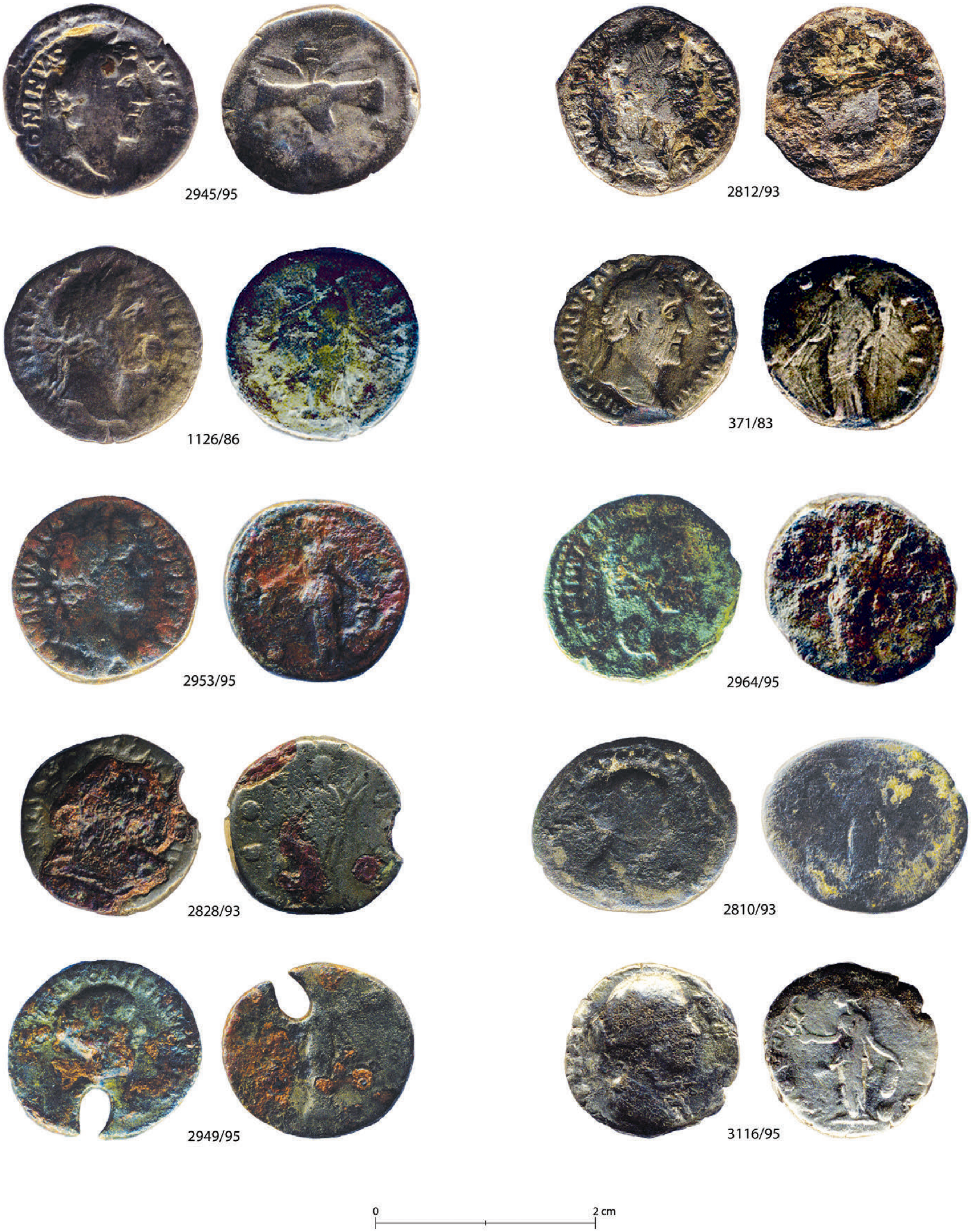

2945/95
2812/93
1126/86
371/83
2953/95
2964/95
2828/93
2810/93
2949/95
3116/95
0
2 cm

Figure 6.2f. Coin finds from the Jakuszowice, Kaziemierza Wielka county (photos by the authors).

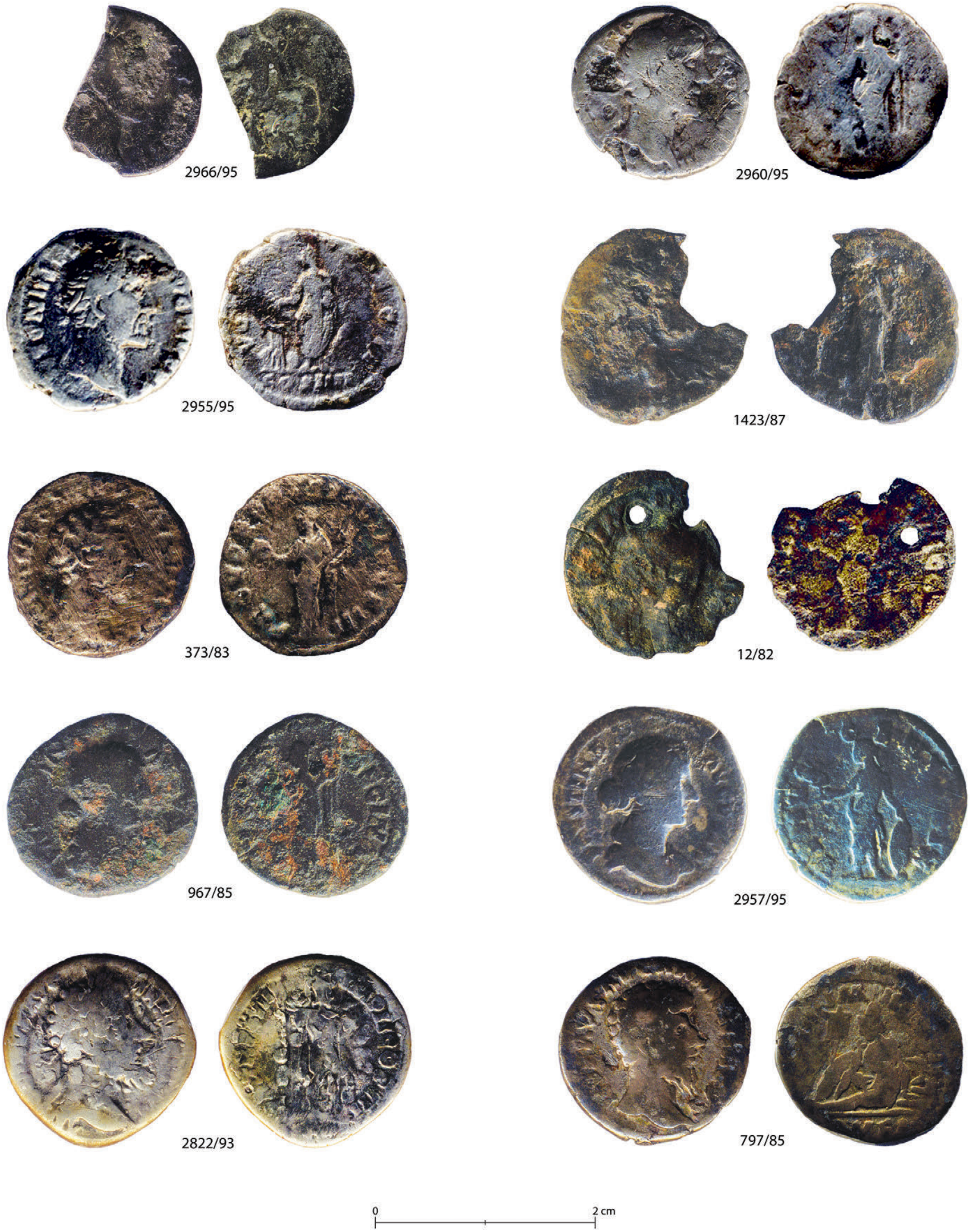

2966/95
2960/95
2955/95
1423/87
373/83
12/82
967/85
2957/95
2822/93
797/85
0
2 cm

Figure 6.2g. Coin finds from the Jakuszowice, Kaziemierza Wielka county (photos by the authors).

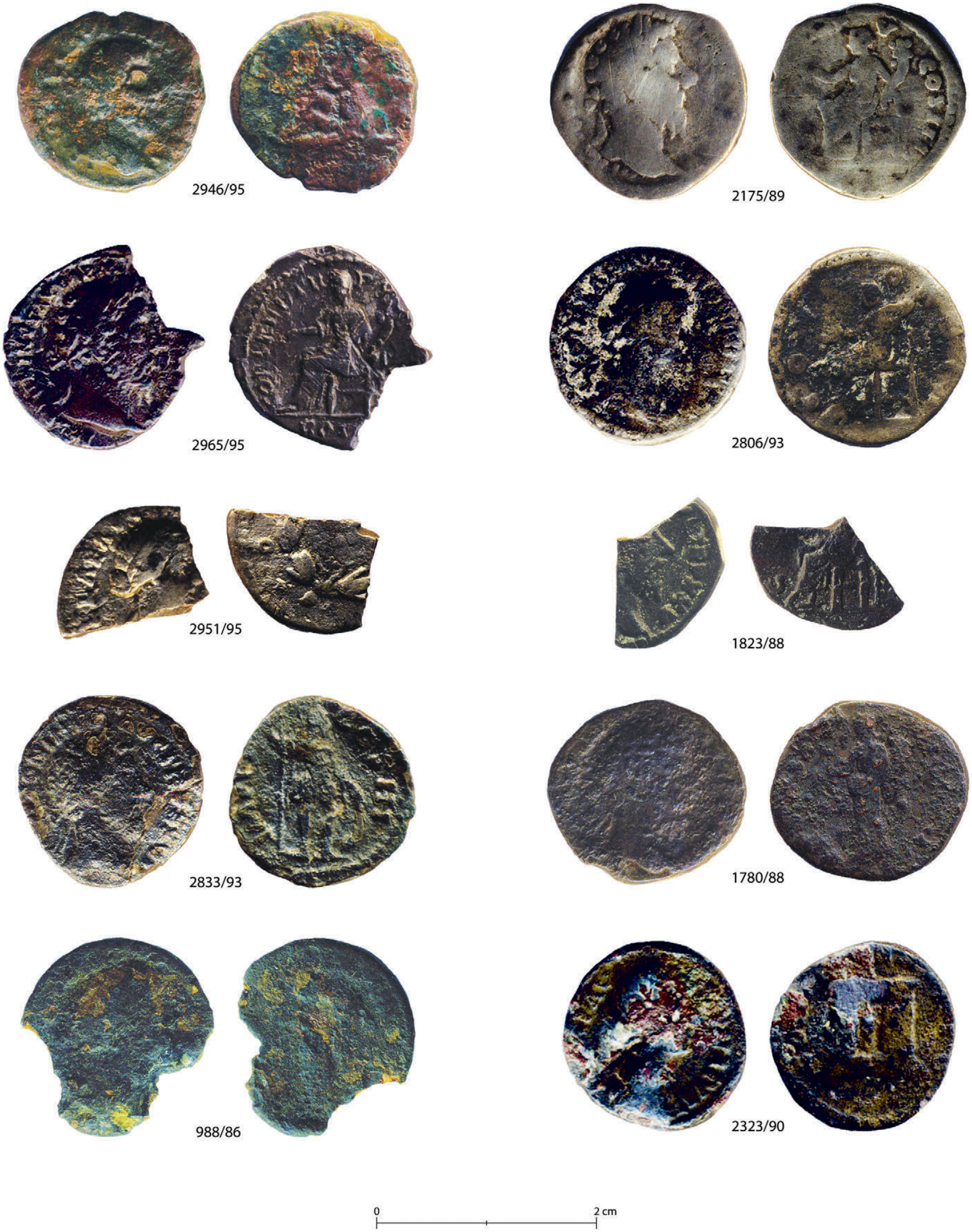

2946/95
2175/89
2965/95
2806/93
2951/95
1823/88
2833/93
1780/88
988/86
2323/90
0
2 cm

Figure 6.2h. Coin finds from the Jakuszowice, Kaziemierza Wielka county (photos by the authors).

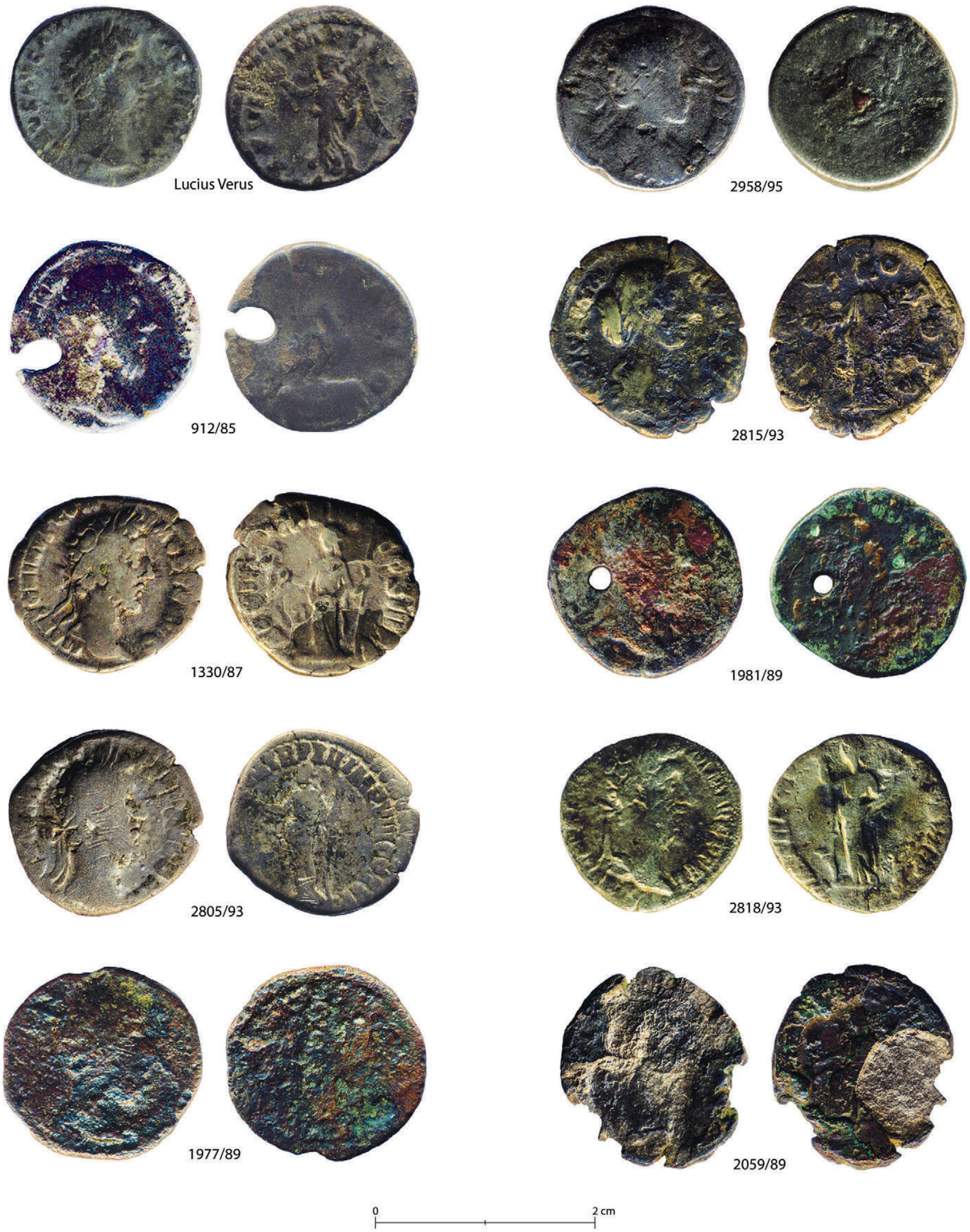

Lucius Verus
2958/95
912/85
2815/93
1330/87
1981/89
2805/93
2818/93
1977/89
2059/89
0
2 cm

Figure 6.2i. Coin finds from the Jakuszowice, Kaziemierza Wielka county (photos by the authors).

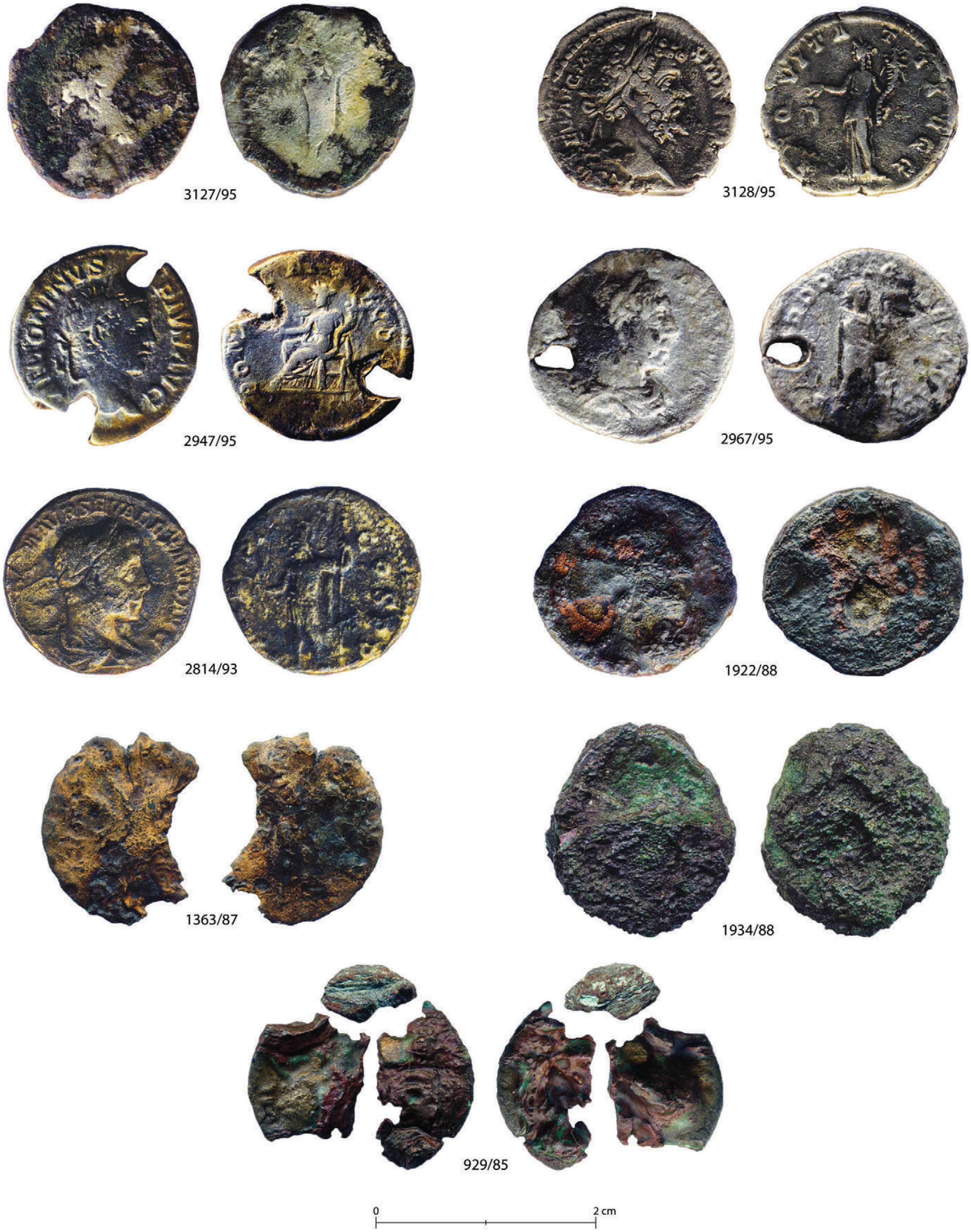

3127/95
3128/95
2947/95
2967/95
2814/93
1922/88
1363/87
1934/88
929/85
0
2 cm

Figure 6.2j. Coin finds from the Jakuszowice, Kaziemierza Wielka county (photos by the authors).

Table 6.1a. Results of metallographic analysis of imperial coins from Jakuszowice, Kazimierza Wielka county.

No.	Inv. no.	Issuer	Denomination	Mint	Ag	Cu	Pb	Au	Zn	Sn	Fe	Ni	Sb
1	W 2834/93	Cn. Cornelius Lentulus	Denarius	Rome	93.06	4.49	1.28	0.61			0.48	0.07	
2	W 2325/90	Vespasian	Denarius	Rome	89.69	8.88	0.75	0.97					
3	W 2962/95	Vespasian (Domitian)	Denarius	Rome	92.39	5.07	1.54	0.51			0.47		
4	W 2138/89	Titus (Domitian)	Denarius	Rome	91.18	7.39	0.73	0.68					
5	W 2820/93	Domitian	Denarius	Rome	75.64	21.66	1.6	0.28			0.03		
6	W 2824/93	Domitian	Denarius	Rome	95.54	3.09	0.71	0.65					
7	2211/89	Domitian?	Denarius	Rome	84.63	11.68	1.24						
8	W 2821/93	Trajan	Denarius	Rome	89.93	9.11	0.61	0.34					
9	W 2954/95	Trajan	Denarius	Rome	92.79	6.07	1.12						
10	W 2829/93	Trajan	Denarius	Rome	58.48	39.42	1.11	0.18		0.76			
11	W 2825/93	Trajan	Denarius	Rome	82.42	15.02	0.95	0.25	1.14		0.18	0.03	
12	2808/93	Trajan	Denarius	Rome	89.15	10.03	0.75	0.05					
13	228/82b	Trajan	Denarius	Rome	86.37	12.08	1.23	0.23			0.08		
14	2826/93	Trajan	Denarius	Rome	88.74	10.19	0.95	0.1					
15	2427	Trajan	Denarius	Rome	88.78	9.56	1.36	0.29					
16	W 2831/93	Hadrian	Denarius	Rome	83.82	14.4	1.62	0.15					
17	W 2832/93	Hadrian	Denarius	Rome	90.63	7.92	1.32	0.13					
18	W 2963/95	Hadrian	Denarius (fragment broken off)	Rome	88.27	9.62	2.06						
19	W 2819/93	Hadrian	Denarius	Rome	80.27	16.54	1.67	0.29	0.69	0.51			
20	W 947/85	Hadrian	Denarius	Rome	89.82	9	1.16						
21	W 2827/93	Hadrian	Denarius	Rome	90.55	7.73	0.8	0.13	0.78				
22	W 2948/95	Hadrian	Denarius (notched, pierced)	Rome	88.03	9.51	2.34	0.06			0.05		
23	W 2809/93	Hadrian	Denarius	Rome	84.13	14.62	1.22	0.03					
24	W 2956/95	Hadrian	Denarius (notched)	Rome	93.83	3.66	1.8	0.6	0.1				
25	W 228/82b	Hadrian	Denarius	Rome	90.35	8.53	0.97				0.13		
26	W 301/83	Hadrian	Denarius	Rome	90.97	7.96	1.04						
27	W 2968/95	Hadrian	Denarius	Rome	84.87	14.36	0.66				0.04	0.06	
28	W 2811/93	Hadrian	Denarius	Rome	90.31	8.28	1.39						
29	W 3315/95	Hadrian	Denarius	Rome	88.93	9.65	1.42						
30	W 2959/95	Hadrian	Denarius	Rome	94.7	4.35	0.82	0.1					
31	W 2807/93	Hadrian	Denarius	Rome	89.69	9.16	0.97	0.18					
32	W 1219/87	Hadrian	Denarius	Rome	92.55	6.85	0.57						
33	W 2944/95	Antoninus Pius (Faustina I)	Denarius	Rome	94.24	4.48	1.12	0.16					
34	W 804/85	Antoninus Pius (Faustina I)	Denarius	Rome	86.33	11.01	2.64						
35	W 2257/89	Antoninus Pius (Faustina I)	Denarius	Rome	83.73	14.16	1.96	0.14					

No.	Inv. no.	Issuer	Denomination	Mint	Ag	Cu	Pb	Au	Zn	Sn	Fe	Ni	Sb
36	W 2830/93	Antoninus Pius (Faustina I)	Denarius	Rome	87.69	10.94	1.35						
37	W 2823/93	Antoninus Pius (Faustina I)	Denarius	Rome	87.69	10.91	1.36	0.02					
38	W 2836/93	Antoninus Pius (Faustina II)	As	Rome	0.04	85.18	0.53		10.41	1.21	0.27	0.06	0.25
39	W 2817/93	Antoninus Pius (Marcus Aurelius)	Denarius	Rome	89.23	9.7	1.02	0.03					
40	W 2945/95	Antoninus Pius	Denarius	Rome	55.35	38.46	2.56	0.23	1.53	1.83			
41	W 2812/93	Antoninus Pius	Denarius	Rome	87.21	11.71	0.73	0.25	0.02		0.8		
42	W 1126/86	Antoninus Pius	Denarius	Rome	91.63	6.61	1.52	0.23					
43	371/83	Antoninus Pius	Denarius (notched)	Rome	72.9	25.79	0.78	0.53					
44	W 2810/93	Antoninus Pius (Faustina II)	Denarius	Rome	71.32	23.31	2.96	0.49	0.7	1.2			
45	W 3116/95	Antoninus Pius (Faustina II)	Denarius	Rome	79.5	18.3	2.17	0.02					
46	W 2969/95	Antoninus Pius / Marcus Aurelius (Faustina II)	As	Rome	0.07	85.35	5.64		4.46	3.83	0.31	0.06	0.24
47	W 2960/95	Antoninus Pius	Denarius	Rome	92.74	5.26	1.84	0.15					
48	W 2955/95	Antoninus Pius	Denarius	Rome	83.37	13.92	2.62	0.08					
49	W 373/83	Marcus Aurelius	Denarius	Rome	86.06	11.91	1.89	0.13					
50	W 2957/95	Marcus Aurelius (Faustina II)	Denarius	Rome	90.95	7.57	1.4	0.05					
51	W 2822/93	Marcus Aurelius	Denarius	Rome	79.02	19.62	0.66	0.7					
52	W 797/85	Marcus Aurelius (Lucius Verus)	Denarius	Rome	76.42	21.16	2.34	0.06					
53	2175/89	Marcus Aurelius	Denarius	Rome	82.91	11.14	4.15	0.56	0.43	0.81			
54	W 2965/95	Marcus Aurelius	Denarius	Rome	92.59	4.59	2.17	0.52			0.12		
55	W 2806/93	Marcus Aurelius	Denarius	Rome	83.13	14.53	2.32						
56	W 2951/95	Marcus Aurelius (Lucilla)	Denarius	Rome	91.43	5.2	3.18	0.04			0.12	0.02	
57	W 2833/93	Marcus Aurelius	Denarius	Rome	92.14	5.85	1.75	0.25					
58	2815/93	Commodus (Crispina)	Denarius	Rome	80.14	17.49	2.33	0.02					
59	W 1330/87	Commodus	Denarius	Rome	83.81	13.4	2.7	0.08					
60	2805/93	Commodus	Denarius (notched)	Rome	76.85	21.31	1.77	0.06					

No.	Inv. no.	Issuer	Denomination	Mint	Ag	Cu	Pb	Au	Zn	Sn	Fe	Ni	Sb
61	W 2818/93	Commodus	Denarius	Rome	81.43	17.1	1.21	0.26					
62	W 2059/89	Commodus	Denarius (with broken fragments)	Rome	78.38	19.35	2.03	0.22					
63	W 3127/95	Marcus Aurelius or Commodus	Denarius	Rome	56.58	42.08	1.05	0.17	0.04			0.03	
64	W 3128/95	Septimius Severus	Denarius	Rome	83.61	14.29	1.6	0.49					
65	W 2947/95	Septimius Severus (Caracalla)	Denarius (with two apertures worn through)	Rome	61.67	36.91	1.07	0.3				0.04	
66	W 2835/93	Caracalla	AE	Caesarea, Cappadocia	0.05	69.25	20.56		7.06	2.72		0.12	0.15
67	W 2967/95	Elagabalus	Denarius (pierced)	Rome	54.59	43.34	1.2	0.3		0.5	0.03	0.02	
68	W 2814/93	Severus Alexander	Denarius	Rome	55.81	42.54	1.06	0.25		0.29		0.02	
69	W 2970/95	Trebonianus Gallus	AE	Viminacium	0.03	76.29	22.3			1.17		0.06	0.07
70	W 1922/88	Claudius Gothicus (?)	Antoninianus		0.13	54.05	16.56			28.52		0.09	0.59
71	W 1363/87	Tetricus I or II	Antoninianus (fragment)		2.83	88.72	1.51			4.65		0.07	0.18
72	2430	Constantius II	Follis		0.28	87.92	9.45		0.05		0.45	0.18	0.27
73	W 2942/95	Valens	Centenionalis	Siscia	0.06	85.57	13.89			0.4	0.13	0.14	0.14

Table 6.1b. Results of metallographic analysis of counterfeits from Jakuszowice, Kazimierza Wielka county.

No.	Inv. no.	Prototype Issuer	Ag	Cu	Pb	Zn	Sn	Fe	Ni	Sb
1	W 895/85	Trajan	-	75.52	2.9	8.96	11.8	0.26	0.7	0.22
2	W 2950/95	Trajan (notched)	0.02	83.93	2.16	0.2	13.31	0.1	0.07	0.14
3	W 1/82	Trajan	-	78.56	4.98	0.18	15.95	-	0.08	0.15
4	W 140/82	Trajan	0.8	72.46	3.49	-	22.63	0.04	0.14	0.19
5	2961/95	Trajan	1.07	79.57	10.47	0.06	8.47	-	0.08	0.21
6	W 2952/95	Trajan	-	70.36	11.12	-	18.18	-	0.08	0.18
7	W 309/83	Hadrian (notched)	0.12	64.49	9.42	0.23	25.26	0.04	0.12	0.24
8	W 1343/87	Hadrian (notched)	-	75.37	14.26	0.03	10	-	0.08	0.17
9	W 366/83	Antoninus Pius	0.05	63.85	10.55	-	25.2	-	0.13	0.16
10	W 1014/86	Antoninus Pius (Faustina I)	0.98	72.67	8.06	0.2	17.61	-	0.09	0.29
11	W 2813/93	Antoninus Pius (Faustina I)	-	71.95	2.91	0.37	24.43	0.04	0.15	0.07
12	W 2943/95	Antoninus Pius (Faustina I)	-	71.59	11.7	-	16.41	-	0.09	0.13
13	W 3209/95	Antoninus Pius (Faustina I)	0.06	72.3	15.8	2.95	8.32	0.19	0.09	0.24
14	W 2953/95	Antoninus Pius	-	71.46	13.55	-	14.76	-	0.09	0.08
15	W 2964/95	Antoninus Pius	0.12	60.93	10.05	0.15	28.02	0.12	0.14	0.19
16	W 2828/93	Antoninus Pius	0.02	69.56	7.64	-	22.4	-	0.11	-
17	W 2949/95	Antoninus Pius (Faustina II)	0.43	67.92	8.98	0.43	21.77	0.04	0.12	0.24
18	W 2966/95	Antoninus Pius	0.03	70.74	3.84	-	25.11	-	0.12	0.04
19	W 1423/87	Antoninus Pius? (fragment broken)	0.82	55.29	8.73	1.39	32.96	0.06	0.17	0.3
20	W 12/82	Marcus Aurelius (notched, pierced)	0.07	82.28	6.84	0.16	10.46	-	0.05	0.06
21	967/86	Marcus Aurelius (Faustina II)	0.74	69.94	8.73	-	19.89	0.05	0.11	0.26
22	W 2946/95	Marcus Aurelius (Lucius Verus)	-	73.88	7.61	0.05	18.2	-	0.8	7.61
23		Lucius Verus	0.05	70.1	3.49	-	25.78	-	0.08	0.2
24	W 1823/88	Marcus Aurelius (fragment)	0.43	66.24	7.22	0.95	24.49	0.06	0.19	0.14
25	W 1780/88	Marcus Aurelius	0.68	68.55	6.49	1.91	21.51	0.47	0.1	0.21
26	W 988/86	Marcus Aurelius (with broken fragments)	0.06	72.04	7.03	-	20.09	0.06	0.1	0.36
27	W 2323/90	Marcus Aurelius (Faustina II)	-	62.74	23.7	-	13.32	-	0.08	0.06
28	W 2958/95	Commodus	0.04	71.35	8.41	-	19.79	-	0.08	0.06
29	912/85	Commodus (Marcus Aurelius) (pierced)	2.01	32.72	24.46	0.44	39.29	0.53	0.13	0.28
30	1981/89	Commodus (pierced)	0.52	65.75	9.94	1.08	21.73	0.05	0.12	0.73
31	W 1977/89	Commodus	0.13	72.76	9.68	-	17.04	-	0.11	0.2
32	929/85	Illegible	-	70.1	9.35	-	19.94	-	0.09	0.25
33	2422	Illegible (pierced)	0.42	67.55	9.18	1.07	20.86	0.18	0.11	0.54

*One coin not included in the table due to poor condition

VITAL' SIDAROVICH

7. Cast Copies of Roman Imperial Denarii from Belarus

ABSTRACT The territory of Belarus is a peripheral zone of the distribution of cast barbarian copies of Roman imperial denarii. Their distribution in the region is associated primarily with the population of the Wielbark culture and its lively contacts with the Chernyakhiv culture, where cast copies were produced, and with the neighbouring Balt cultures on whose territory a small number of these coins is also recorded. A study of cast copies of Roman denarii using LIBS (Laser-Induced Breakdown Spectroscopy) showed that their elemental composition is very diverse — from specimens made of alloys based on copper, tin, or lead to coins with a very high silver content.

KEYWORDS cast copies of denarii, Barbaricum, Wielbark culture, elemental composition

Finds of Cast Copies of Roman Denarii in Belarus and their Cultural and Chronological Context

While the main distribution of cast copies of Roman denarii is on the territory of the Chernyakhiv culture, which occupied a significant part of the territory of modern Ukraine, Moldova, and Romania during the Roman period, some of these coins have been found outside the range of this archaeological unit. The focus of this study are find-spots recorded in regions more to the north, e.g. the area of the basin of the Western Bug River found in Belarus, the region of the Belarusian Polesie, and the basin of the Neman River quite distant from the Chernyakhiv territory (Sidorovich 2021a).

Belarusian finds of cast coins are fairly rare. To date, forty-seven coin finds recorded in Belarus were identified as cast copies of Roman denarii of the last quarter of the first–early third centuries (Map 7.1). Almost all of them are single finds, and only two find-spots (Biazvierhavichy in Slutsk district, Minsk region, and Stavishcha in Brest district, Brest region) could be elements of so-called collective finds. Just one coin derives from regular archaeological fieldwork, excavated on the settlement site Radasć-2 in Kamyanets district, Brest region, by the team of Alena Kasyuk.[1] All the other coins were discovered by treasure hunters and recorded only through the regular monitoring of metal-detecting forums, followed where possible, by communication with individual finders.[2] Each time, during these exchanges I stressed the importance these artefacts have for science, and the urgency to have them preserved in state museum collections. As a result of these efforts fourteen coins were submitted

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[1] I am indebted to Alena Kasyuk for permission to publish this find.

[2] We are well aware that cast copies of denarii recorded by us are little more than 'the tip of the iceberg' because only some finders are ready to volunteer information about their discoveries. What is more, after the tightening in the Republic of Belarus of the law on metal-detector use the treasure hunters no longer upload photographs of their finds to forums as often.

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Counterfeits, Imitations, and Copies of Roman Imperial Denarii: Making and Faking Coins on Both Sides of the Limes, ed. by Arkadiusz Dymowski and Kyrylo Myzgin, WSA, 8 (Turnhout, 2024), pp. 135–153. This is an open access chapter made available under a CC BY-NC 4.0 International Licence.

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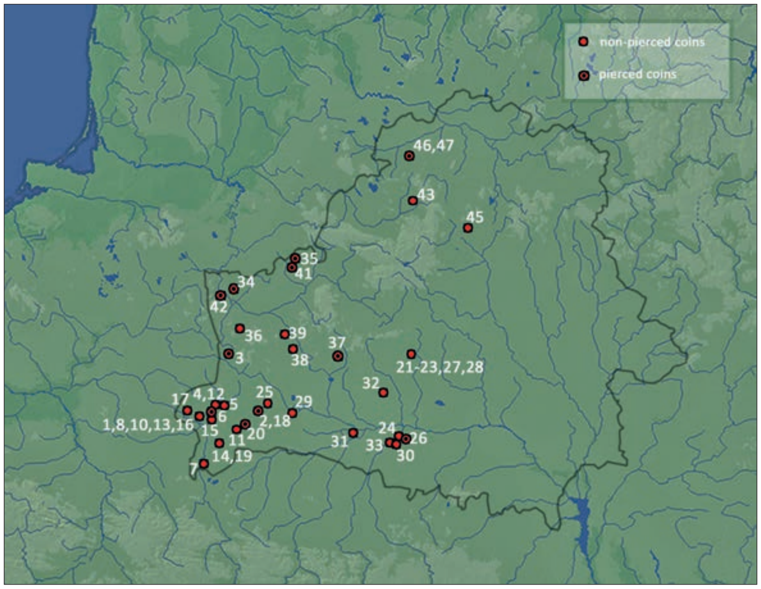

Map 7.1. Finds of cast copies of Roman imperial denarii from the territory of Belarus (the numbering on the map corresponds to the numbering in the Catalogue): 1, 8, 10, 13, 16 — Stavishcha, Brest region; 2, 18 — Hrushava, Brest region; 3 — Yatviesk, Hrodna region; 4, 12 — Dziamianchycy, Brest region; 5 — Radasć, Brest region; 6 — Charnaŭchycy, Brest region; 7 — Damachava, Brest region; 11 — Chyzheŭshchyna, Brest region; 14, 19 — Pazhezhyn, Brest region; 15 — Druzhba, Brest region; 17 — Stavy, Brest region; 20 — Pieski, Brest region; 21–23, 27–28 — Biazvierhavichy, Minsk region; 24 — Vieliamichy, Brest region; 25 — Raviacichy, Brest region; 26 — Davyd-Haradok–Vieliamichy, Brest region; 29 — Homsk, Brest region; 30 — Rubeĺ, Brest region; 31 — Ploshchava, Brest region; 32 — Kormuzh, Brest region; 33 — Rubieĺ–Berazhnoe, Brest region; 34 — Byĺchycy, Hrodna region; 35 — Zhyrmuny, Hrodna region; 36 — Hniezna, Hrodna region; 37 — Ucios, Brest region; 38 — Slonim, Hrodna region; 39 — Klimavichy, Hrodna region; 41 — Vialikiya Reksti, Hrodna region; 42 — Navasiolki, Hrodna region; 43 — Izbina, Minsk region; 45 — Kastryca, Minsk region; 46–47 — Staryja Sharabai, Vitebsk region (coins numbered 9, 40, and 44 have only an approximate location so they are not marked on the map) (data and drawing: Vital' Sidarovich).

to the Numismatic Cabinet of the Belarusian State University (subsequently, NC BSU).

As a rule, in Belarus finds of cast denarii either mark the extent of the Wielbark culture territory, or indicate zones influenced by this culture. The Wielbark archaeological culture existed in Poland, Belarus, and Ukraine throughout the Roman period and in the early Migration period. Its bearers were East Germanic tribes, primarily the Goths. On the territory of Belarus, the area of this culture covered, first of all, the basin of the Western Bug, a region with documented Wielbark culture sites (Beljavec 2016a, 390), some investigated through regular excavations (see Kukharenko 1980; Beljavec 2006). Twenty finds of cast copies of denarii were recorded here, half of them discovered in the basin of the Lyasnaya River (left-bank tributary of the Western Bug) — a region with the largest concentration of Roman coins in Belarus (Sidorovich 2013, 21).

More outstanding among the coin finds from the banks of the Lyasnaya River are five cast copies of denarii found in the vicinity of the rural settlement Stavishcha (cat. nos 1, 8, 10, 13, 16). They belong to a group of several hundred coins (mostly, Roman imperial denarii) recovered east of Stavishcha on the right bank of the floodplain of the Lyasnaya River. According to the information obtained gradually over more than a decade the coins were picked up from an area of a few score thousand metres. According to my private correspondence with treasure hunters the same area reportedly also produced other artefacts — personal ornaments, some made of silver or gold, and weapons.

A surface survey made on the floodplain of the Lyasnaya near Stavishcha by Vadzim Beljavec found no evidence of occupation at a location that had been reported as the find-spot of a large number of the coins. The nearest archaeological site with Iron Age materials, identified by V. Beljavec (2012, 21–22) on the north-eastern margin of the village Kaviardziaki, lies at a distance of at least 1 km to the south-west of the area which produced the great number of coins. The size of that area, and the marshy character of its soils[3] made me doubt my earlier interpretation of the coin finds from Stavishcha as elements of a hoard, or hoards (Sidarovich 2011). It is more likely that — rather than belonging to a deposit (deposits) of coins (or coins and other objects?), the result of hoarding activity — the coins are evidence of some ritual activity (votive offerings?). An indirect confirmation of the significance that the area in the middle reaches of the Lyasnaya River (between the modern town of Kamyanets and the northern part of the Brest district) may have had for the Wielbark population is the high concentration of Roman-period sites observed here. These include several settlements identified on the Lyasnaya riverbank across from Stavishcha near the villages Druzhba, Charnaŭchycy, and Niesvilo, dated to the Roman period and containing Wielbark materials (Beljavec 2016a, fig. 2).

In addition to the coins recovered outside Stavishcha, the basin of the Lyasnaya produced a few more cast copies of Roman denarii. They were recovered near the villages Druzhba (cat. no. 15), Charnaŭchycy (cat. no. 6), Dziamianchycy (two specimens (cat. nos 4 and 12)), and Radasć (cat. no. 5).

Cast copies of Roman denarii have been recorded in other parts of the basin of the Western Bug in Belarus: in the basin of the Mukhavets — at Hrushava (two specimens (cat. nos 2 and 18)), Pieski (cat. no. 20), and Chyzheŭshchyna (cat. no. 11); in the basin of the Pulva — at Stavy (cat. no. 17); in the basin of the Ryta — at Pazhezhyn (two specimens (cat. nos 14 and 19)). One of the coin finds from Pazhezhyn is unique for being the only copy of a Roman denarius retaining the casting sprue recorded in Belarus (Fig. 7.5.13) (Sidarovich 2017, 131 pl. 3, fig. 6).

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[3] On maps from the late nineteenth–first half of twentieth century this area is shown as predominantly swampy. This part of the floodplain of the Lyasnaya was only subject to agricultural drainage projects in the second half of the twentieth century.

One more cast copy of a denarius was recorded in Belarus on the northern margin of the basin of the Western Bug, in the Narew River drainage, near the village Yatviesk (cat. no. 3). This coin is interesting because it has a hole. Three other cast specimens from the same region are pierced, but have the hole near the edge, whereas in the coin from Yatviesk the hole is drilled right through the centre. Let us note that cast and pierced coins have been recorded in different regions of the country; a more extensive discussion of possible purposes of this practice is given in the Conclusions.

We can attribute the presence of cast copies of denarii in the western part of the Prypiat Polesie to the expansion of the Wielbark culture population (or, at least, to non-Wielbark groups under its powerful influence). It remains an open question whether this area was a Wielbark culture territory or not. According to Vadzim Beljavec there is sufficient evidence to include in the Wielbark culture territory only the area of the Pinsk-Stolin Polesie (Beljavec described this region as 'Turov-Pinsk Polesie' in his studies, but in my view this is incorrect in view of the scarcity of Wielbark culture finds in the Turov region, and of Roman coin finds too) — the basin of the Styr and the Haryn' Rivers (right-bank tributaries of the Prypiat) — and the lower reaches of the Yaselda — left-bank tributary of the Prypiat River (Beljavec 2016a, 391–92 fig. 2). Five cast copies of Roman denarii have been recorded in this area. The most remarkable of them were found in the Stolin district, Brest region. At least four cast copies were recovered from a relatively small area on the right bank of the Haryn' River (right-bank tributary of the Prypiat), between the city of Davyd-Haradok and villages Rubeĺ and Vieliamichy (cat. nos 24, 26, 30, 33). The large number of Roman-period materials recorded in the lower reaches of the Haryn' River, most of them 'amateur' metal detectorist finds, suggest this region was significantly influenced by the Wielbark culture, and possibly, by the Chernyakhiv culture too (Beljavec 2007, 137).

Two finds of cast copies of denarii were recorded in the elevated plain of Zaharodzie which extends between the basin of the Western Bug and the region of the Pinsk-Stolin Polesie. They were found at Raviacichy (cat. no. 25) and Homsk (cat. no. 29). According to V. Beljavec, the plain of Zaharodzie, delimited in the north-east by the Yaselda River, rather than being a part of the Wielbark culture territory, was settled by Post-Zarubyntsi groups (Beljavec 2016a, 392), which were one of the main sources of the formation of early Slavic cultures. In my view this statement is only partly true in view of the discovery on the right bank of the Yaselda River of individual coins and other objects identifiable with a Gothic influence, like the Malech Hoard of Roman denarii hidden deliberately in a Wielbark culture pottery vessel (Type Wołągiewicz-I B) (Sidorovich 2012; Beljavec 2009, 174).

Of particular interest in the group of finds from the region of Polesie are coins recovered at Biazvierhavichy (cat. nos 21–23, 27, 28): out of an unknown number of denarii found at this locality at least five appear to be cast specimens. The find-spot is located on the right bank of the Sluch River (left-bank tributary of the Prypiat), which according to the Ukrainian archaeologist Oleksandr Milashevskiy marks the eastern boundary of the Wielbark culture territory in this part of Polesie (Milashevskii and others 2018, 164).

Let us note that one of the cast copies of denarii from the Prypiat Polesie has a hole, made near the edge. This specimen was found between Davyd-Haradok and the village Vieliamichy (cat. no. 26).

Of some special interest to our research are finds from an area that for the time being cannot be identified reliably with the Wielbark culture population. First of all, there is a group of eleven cast copies of denarii found in the basin of the Neman River. Six of them were discovered in the left-bank area of this basin adjacent to the basin of the Western Bug and to the area of Prypiat Polesie. Four cast copies are recorded in the drainage basin of the Shchara River: one specimen at Klimavichy (cat. no. 39), two coins on the outskirts of Slonim (cat. nos 38, 40), and a very interesting copy of a denarius of Hadrian found at Ucios in the Baranavichy district (cat. no. 37), with two holes which make it resemble a clothes button rather than a pendant (Fig. 7.5.10). The basin of the Shchara River lies very close to the Yaselda, the river regarded by V. Beljavec as one of the possible routes taken by the Goths on their way into the Prypiat Polesie from the territory of present-day Poland (Beljavec 2016a, 394–96). I think it likely that the Yaselda River was used by the migrating Gothic groups also on their way back from Polesie to the basin of the Neman River. These migrations can be identified equally well with surprise attacks made by the troops of Ermanaric at the rear of the Wends (Shchukin 2005, 215–19) as with the withdrawal of individual Gothic groups into the forest zone after the crushing defeat inflicted by the Huns.

The Goths could have found their way to the lands drained by the Neman from another direction too — the territory of modern Poland, to be precise, the basin of the Narew, where a large number of

Wielbark culture sites is recorded (Andrzejowski 2007, 229–58, fig. 1), while sites on the north-eastern margin of the range of this culture (e.g. Czuprynowo) lie in the upper reaches of the left-bank tributaries of the Neman, in other words, in the Polish part of the basin of the Neman River (Andrzejowski 1995). To the east of these sites we recorded two further cast copies of denarii, recovered on the left bank of the Belarusian part of the basin of the Neman — at Navasiolki (not far from the Neman (cat. no. 42)) and at Hniezna (in the basin of the Ros' River (cat. no. 36)). Geographically very close to these finds is a third — a coin recovered at Byĺchycy (cat. no. 34), not far from the Neman, but on its other, right bank. Unfortunately, at this time we have no reliable evidence that the territory of the Wielbark culture extended anywhere all the way to the Neman River.

Four equally remarkable cast copies were recorded in the right-bank area of the Neman drainage, in the basins of its right-bank tributaries, even farther away from any of the known sites identified with the Wielbark culture. They are the finds from the basins of the Gaŭja (cat. no. 35) and the Dzitva (cat. no. 41), and from the upper reaches of the Vilija (cat. nos 43, 44).

The basin of the Neman, a region of Belarus with a large number of single finds of Roman and East Germanic imports (sadly enough, almost all of them are treasure hunter finds, and most of them rather than being submitted to a museum end up on the 'black market'), may be regarded with some confidence as a zone of impact (expansion?) of the Wielbark culture (Sidarovich 2020, 7–8). This hypothesis can be substantiated only by conducting regular archaeological fieldwork in a region that for the past few decades has been neglected in this respect. The basin of the Neman is traditionally regarded as a territory settled in the Roman period by the Balts. The population established in the first half of the first millennium in the upper and middle reaches of the Neman is identified with either the Eastern or the Western group of Balt tribes (Medvedev 2011, 10–11, 27). Nevertheless, the character of hoards from the Hrodna area of the Neman drainage, made up largely of Roman imperial denarii (Sidorovich 2021b), suggests the presence in the region of small groups of East Germanic arrivals. This is supported further by the large number of artefacts from single finds that are more typical of the Gothic rather than of any of the Balt cultures: some brooch types (Beljavec 2018, 48–59; 2016b, 64 fig. 5: 2), axe pendants (Beljavec 2016b, 64), and so on. Unfortunately, the vast majority of these objects originate from illegal excavations, and only a small fraction find their way into museum collections, the rest may never enter scientific circulation.

It is important to note that while pierced cast denarii found in the basin of the Western Bug and the region of Polesie are quite rare, six out of eleven coins from the drainage basin of the Neman have holes. In addition to the coin with two holes from Ucios in the Baranavichy district, four of these specimens have a hole near the edge (cat. nos 34, 40–42), while the sixth coin is pierced through the centre (cat. no. 35).

In the group of cast copies of denarii from the Neman basin two finds from the upper reaches of the Vilija, the largest tributary of the Neman, require separate discussion. Their location is very close to that of the only cast denarius copy found in the basin of the Byarezina River (cat. no. 45). In fact, all three of these locations gravitate towards the Byarezina-Vilija (or, more broadly — the Dnieper-Neman) watershed. In the first–second centuries AD the upper reaches of the Vilija and Byarezina had been occupied by the Eastern Balts — bearers of the late phase of the Brushed Pottery culture (Egoreichenko 2006, 59 fig. 14). Most likely, they continued in that region also in the late Roman period, but their peaceful existence was now disturbed by some groups on the move from the south-east. This shift to the north and north-western regions observed around the middle of the third century is identified with the Kyiv culture,[4] to be exact, with its Upper Dnieper group, followed at the beginning of the fourth century by another wave of the Kyiv culture people migrating to the basin of the Dvina. These processes gave rise to an archaeological group defined as Type Zaozerye, established in the middle reaches of the Dvina River and on the adjacent territory until the end of the fifth century (Lopatin and Furasyev 2007, 70–72, 90–91). While for the time being the extent of sites with Type Zaozerye materials is not clearly identified, according to Nikolay Lopatin and Aleksey Furasyev their finds extend to the south-west as far as the upper reaches of the Byarezina and Vilija (Lopatin and Furasyev 2007, 6 fig. 31). On the other hand, we cannot associate the presence of cast copies of denarii in this region with Type Zaozerye communities because not a single coin of this description has been recorded on Kyiv culture sites in Belarus. Apparently, it is fully legitimate to regard the Vilija-Byarezina watershed as a zone of contact of the bearers of the Kyiv culture tradition with the Balts, who in turn had close ties with East Germanic peoples.

Presumably we can assign the most northerly finds of cast copies of denarii recorded in Belarus at Staryja Sharabai (cat. nos 46–47), a village near the Arzhanitsa River (minor left-bank tributary of the

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[4] Kyiv archaeological culture existed in the second–fifth centuries on the territory of modern Ukraine, Belarus, and Russia. It was located north of the area of the Chernyakhiv culture. The ethnicity of the Kyiv culture remains uncertain, but its important role in the formation of the early Slavs is undoubted.

Dvina), to the same contact zone. Two coins found at this location have a hole near the edge. This part of the Dvina basin (Hlybokaye and Dokshytsy districts in the Vitebsk region) is characterized by a fairly large number of finds of Roman coins, but these are mostly large copper denominations of imperial issue, most likely brought to the area as a result of West Balt impact (Sidarovich, in press).

Unfortunately, the archaeological sites of the Iron Age from the area between the Rivers Dvina, Neman, and the Dnieper are still poorly recognized. Artefacts decorated with champlevé are relatively frequent here (Radiush 2021, fig. 1), and most of them come from amateur metal detectorist activity, but they nevertheless confirm the major impact exerted on the region by cultures of the champlevé enamels horizon. Let me add in this context that we need to consider as a source of this impact both the area with Type Zaozerye materials and the Dvina-Neman zone of concentration of Eastern European enamels (Bitner-Wróblewska 2021, fig. 1). It is likely that even in the late Roman period the region where the basins of the Dnieper, Dvina, and Neman meet was a nodal point for commercial as well as other forms of exchange. Most likely the influence of not only cultures of the champlevé enamel horizon, but also of others, including the Wielbark culture, was felt here, as evidenced by finds of cast copies of denarii. In this context we must assume that the Dvina-Neman-Dnieper watershed was traversed, already in the third and the fourth centuries, by a communication route (Kazanski 1992, fig. 17; Shchukin 2005, fig. 82). As suggested by Mikhail Kazanski, this river route would have used the Neman, Vilija, Byarezina, and the Dnieper Rivers during the Roman and the Migration periods (Kazanski 2012, 111–12).

Elemental Composition of the Cast Copies of Denarii

Probably one of the key tasks undertaken within the *Barbarian Fakers* research project is the study of the elemental composition of cast copies of Roman denarii. Different methods can be used for this purpose: XRF (Nadvirnyak and Pohorilets 2018, 17–18; 2019, 32; Pohorilets and Nadvirnyak 2021, 176), PIXE (Buhay and Myzgin 2021, 39–40), etc. From what I understand the results of XRF analysis must be treated with extreme caution. While this method is attractive because it is non-destructive, it does not enable a layer-by-layer examination of the sample and cannot investigate how the concentration of the elements changes with the depth. The XRF method can determine the elemental composition of the surface of a coin (often patinated and/or contaminated), which as our research at the Belarusian State University (BSU) showed (see below), often differs (sometimes substantially) from the composition of the metal at a greater depth.

In this respect PIXE (Particle Induced X-ray Emission) is a more promising method, one that Oleksandr Buhay and Kyrylo Myzgin (2021, 39–40) have used in their analysis of the chemical composition of coins. While the principle of this method is similar to that of the widely used XRF, in PIXE the signal-to-noise ratio is significantly improved, assisting the examination of samples, raising the sensitivity of the analysis, and reducing potential error.

Our research was undertaken at the Department of Laser Physics and Spectroscopy of the Faculty of Physics of the Belarusian State University[5] using LIBS — Laser Induced Breakdown Spectroscopy — a tool for qualitative and quantitative analysis where the target substance is vaporized to collect spectra induced by double pulse laser excitation. Our study of the elemental composition of cast copies of denarii is far from the first to be implemented jointly by the staff of the Faculty of History and the Faculty of Physics of the Belarusian State University. Earlier research projects focused on seventeenth-century coins (Voropai and others 2013) and ancient coins (Sidorovich and Ermalitskaia 2021).

The advantages of the LIBS method are as follows: high sampling locality (size of the laser spot on the surface of the 'target' ~ 50–100 μm); small amount — $\sim 10–^{10–11}$ g — of substance vaporized in one laser pulse; analysis without preliminary chemical and mechanical treatment of samples; high sensitivity — element concentration determination $\sim 10–^{4}$. In our study every sample was analysed using a series of pulses (three to thirty, depending on patination and contamination levels), which made it possible to carry out a layer-by-layer analysis of the coins. Thus, where no contamination, patina, or scale was observed on the surface of the sample, and there was no doubt as to the absence of coating and heterogeneity of the composition at a greater depth, three double laser impulses were enough to test the sample to a depth of 5 μm. In all other cases, the number of pulses, and, accordingly, the depth of investigation, could be increased (for the LIBS method itself, there are no restrictions on the investigation depth, but a comparison of the concentration of elements at a different depth in a sample showed that it is impractical to exceed thirty pulses). The results obtained from the outer ('dirty')

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[5] I express my gratitude to Ksenia Ermalitskaia, Associate Professor at the Department of Laser Physics and Spectroscopy of the Faculty of Physics of the Belarusian State Faculty, without whom the implementation of the Belarusian part of the *Barbarian Fakers* project would not have been possible.

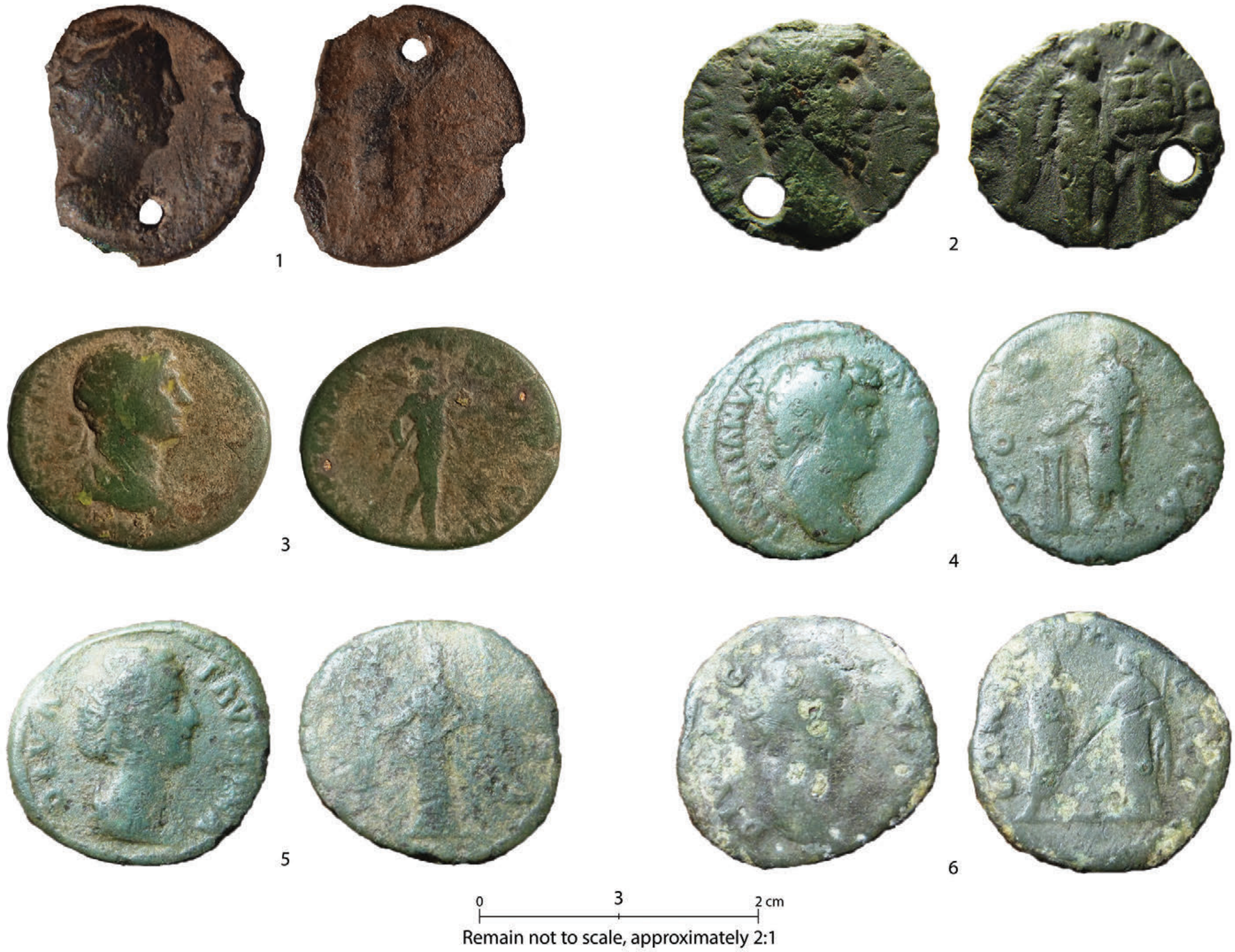

Figure 7.1. Cast copies of Roman denarii with absolute dominance of copper: 1 — Davyd-Haradok–Vieliamichy, Brest region; 2 — Vialikiya Reksti, Hrodna region; 3–6 — Biazvierhavichy, Minsk region (photo: Vital Sidarovich).

Table 7.1. Elemental composition of coins with an absolute dominance of copper, given as a percentage.

	Location	Catalogue number	Ag	Cu	Pb	Sn	Zn	Fe	Notes
1	Davyd-Haradok–Vieliamichy	26	2.02	89.10	5.34	2.85	0.00	0.69	pierced coin
2	Vialikiya Reksti	41	0.00	96.23	1.83	1.94	0.00	0.00	pierced coin
3	Biazvierhavichy	21	0.00	90.80	5.52	3.68	0.00	0.00	
4	Biazvierhavichy	23	0.00	89.89	5.55	4.56	0.00	0.00	
5	Biazvierhavichy	28	0.00	94.20	3.29	2.52	0.00	0.00	
6	Biazvierhavichy	27	0.00	89.76	5.23	5.00	0.00	0.00	

Table 7.2. Elemental composition of coins with a predominance of copper and a relatively high content of tin and/or lead, given as a percentage.

	Location	**Catalogue number**	**Ag**	**Cu**	**Pb**	**Sn**	**Zn**	**Fe**	**Notes**
1	Brest, vicinity	9	0.00	75.80	3.18	21.03	0.00	0.00	
2	Charnaŭchycy	6	1.81	68.77	5.28	23.95	0.00	0.19	pierced coin
3	Vieliamichy	24	9.87	70.55	5.39	13.41	0.44	0.34	
4	ByĺChycy	34	0.00	73.94	17.52	8.54	0.00	0.00	pierced coin
5	Yatviesk	3	0.00	69.70	15.46	14.83	0.00	0.00	pierced coin
6	Biazvierhavichy	22	0.00	82.22	12.57	5.20	0.00	0.00	
7	Vileyka district	44	0.00	80.96	5.91	13.14	0.00	0.00	
8	Radasć	5	2.59	70.14	7.57	19.70	0.00	0.00	
9	Izbina	43	0.00	71.90	20.54	7.36	0.20	0.00	
10	Staryja Sharabai	46	0.00	77.75	17.66	4.40	0.19	0.00	pierced coin
11	Staryja Sharabai	47	0.00	72.52	17.48	8.06	1.95	0.00	pierced coin

layers, which most often differed from the results obtained from the lower ('pure') layers, were cut off (as a rule, relatively unstable concentrations of certain elements were observed in several upper layers, while in the layers below them (down to the bottom layer) this concentration was quite homogeneous). For the final value of the concentration of elements, the averaged indicators of all 'pure' layers were used. At the same time, we left out elements with a content of less than 0.01 per cent from the final table of results. Obviously, unlike XRF and PIXE, this method is destructive, but the destruction is minimal.

The tasks completed as part of the research made within the *Barbarian Fakers* project included collecting data about finds of cast copies of denarii and ensuring their submission to museum collections, and also securing for analysis coins that are at present in private hands. Ultimately, twenty-six specimens were obtained for the elemental composition analysis, fourteen coins from the collections of the NC BSU, and twelve coins from private collections. The diameter of the craters made on the surface of the analysed coins was *c.* 100 μm, their depth — 5 to 50 μm (the depth depended on the presence or absence of patina).

Based on the results of our study (undeterred by the rather low representativeness of the sample) we distinguished four groups of cast coins depending on their elemental composition (two coins were not included in any of these groups).

Group 1. Coins with an absolute dominance of copper (Fig. 7.1). Contain small amounts of lead and tin, and generally contain no silver or zinc (Table 7.1). A small admixture of silver, and a small admixture of iron was only identified in one of these coins.

Group 2. Coins with a predominance of copper and a relatively high content of tin and/or lead (Fig. 7.2). The group with the largest number of coins. While similar to the coins of the previous group, these specimens are characterized by a higher content of lead or tin (at least 12.5 per cent), and a higher content of both these elements simultaneously (Table 7.2). One coin (from Vieliamichy) has a rather high silver content — 9.87 per cent. Note that nearly half the coins in this group have a hole.

Group 3. Coins with a predominance of lead and tin (Fig. 7.3). This group includes only two coins, one of them (from Zhyrmuny) is almost entirely composed of a lead-tin alloy, the second (from Stavishcha) has quite a significant (10.33 per cent) admixture of silver (Table 7.3).

Group 4. Coins with a predominance of silver (Fig. 7.4). Closest in composition to their prototype (Roman denarii) and their struck imitations. As a rule, silver in these coins not only predominates, but absolutely dominates (Table 7.4). All have a small admixture of lead, some have a slight admixture of zinc.

Two cast copies were not included in any of the four groups (Table 7.5) because they did not match their parameters. One coin (from Pieski) has approximately the same content of copper and silver, and also some impurities of lead and zinc. The second coin (from Hrushava) contains a slight predominance of silver which brings it closer to the coins in Group 4, but on the other hand, it has a large amount of tin, which is characteristic of Group 2.

In any case, the division of cast copies of denarii into groups proposed here is only provisional, covering as it does only a small number of coins. Only by making a

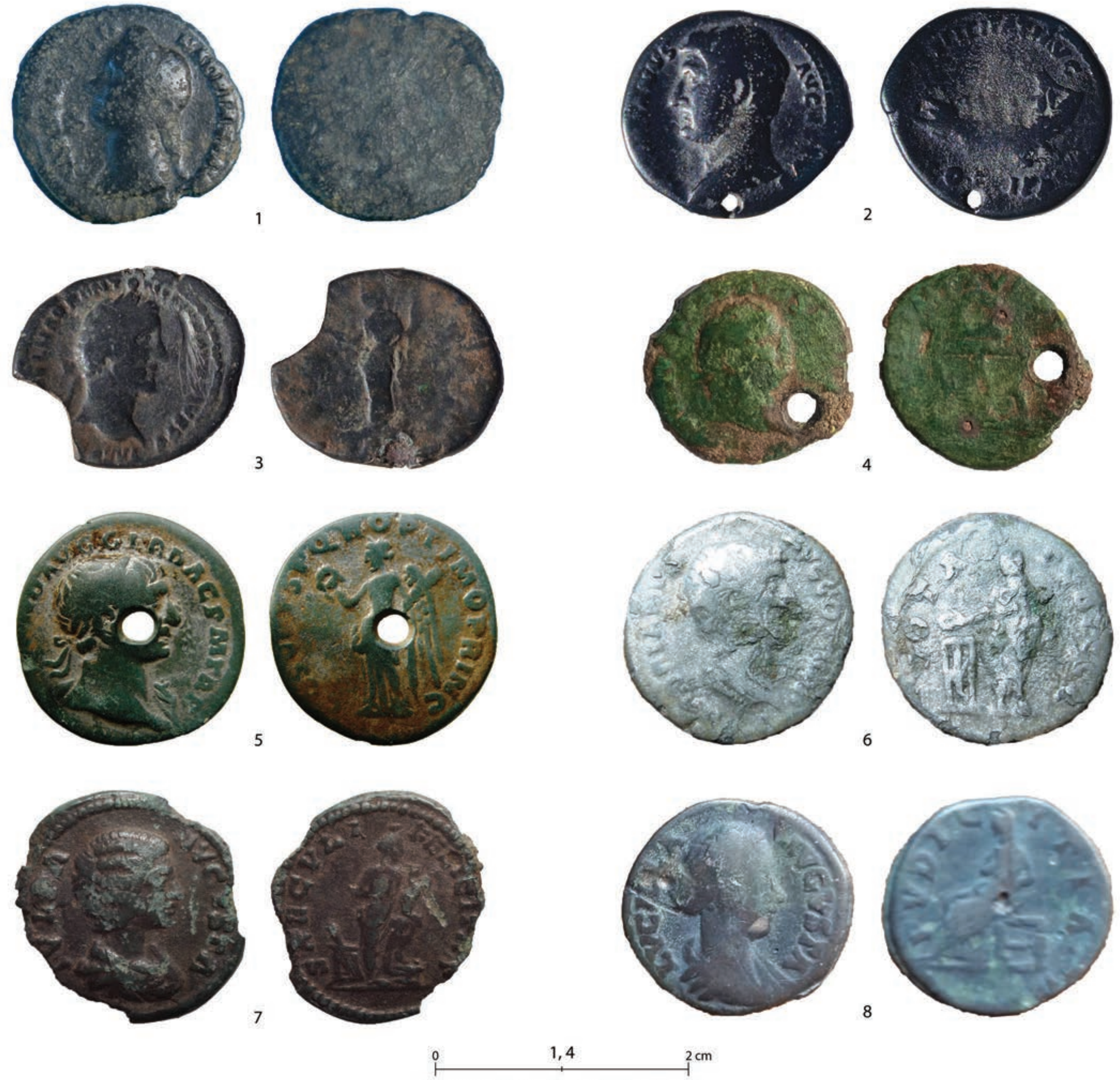

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Figure 7.2. Cast copies of Roman denarii with a predominance of copper and a relatively high content of tin and/or lead: 1 — environs of Brest, Brest region; 2 — Charnaŭchycy, Brest region; 3 — Vieliamichy, Brest region; 4 — Bylchycy, Hrodna region; 5 — Yatviesk, Hrodna region; 6 — Biazvierhavichy, Minsk region; 7 — Viliejka district, Minsk region; 8 — Izbina, Minsk region (photo: Vital Sidarovich).

Table 7.3. Elemental composition of coins with a predominance of lead and tin, given as a percentage.

	Location	**Catalogue number**	**Ag**	**Cu**	**Pb**	**Sn**	**Zn**	**Fe**	**Remarks**
1	Stavishcha	1	10.33	1.28	56.33	31.81	0.00	0.25	
2	Zhyrmuny	35	0.00	0.00	42.02	57.71	0.00	0.27	pierced coin

study of the regions of distribution of these coins and correlating the data obtained can we expect to obtain a more reliable picture. Obviously, first and foremost in this regard are the finds from Ukraine — the territory with the vast majority of recorded cast copies of denarii.

When we compared the results of our research with those of Ukrainian colleagues we note that some groups of coins show significant similarities. Thus, Oleksandr Nadvirnyak and Oleh Pogorilets obtained results indicating the presence of at least two distinct groups of cast denarii — one with an absolute dominance of copper, and one with an absolute dominance of silver (Nadvirnyak and Pohorilets 2019, 32–34). Similarly, Oleksandr Buhay and Kyrylo Myzgin (2021, 40–41) found that a significant percentage of barbarian imitations are made of alloys with a very high silver content (84.89 to 98.21 per cent). Within the pool of cast copies of Roman denarii discovered in the eastern part of the area of the Chernyakhiv culture Kyrylo Myzgin and Sergyi Kodatskiy distinguished three groups: coins made of copper, lead, and tin alloys (with a predominance of tin); coins made of copper and lead alloys (with about the same content of tin and copper); and coins made of copper, lead, and tin alloys (with a significant

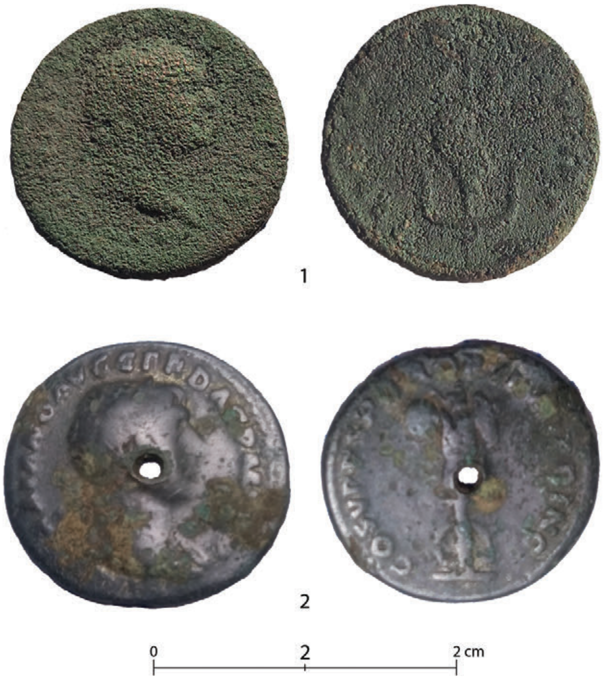

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Figure 7.3. Cast copies of Roman denarii with a predominance of lead and tin: 1 — Stavishcha, Brest region; 2 — Zhyrmuny, Hrodna region (photo: Vital Sidarovich).

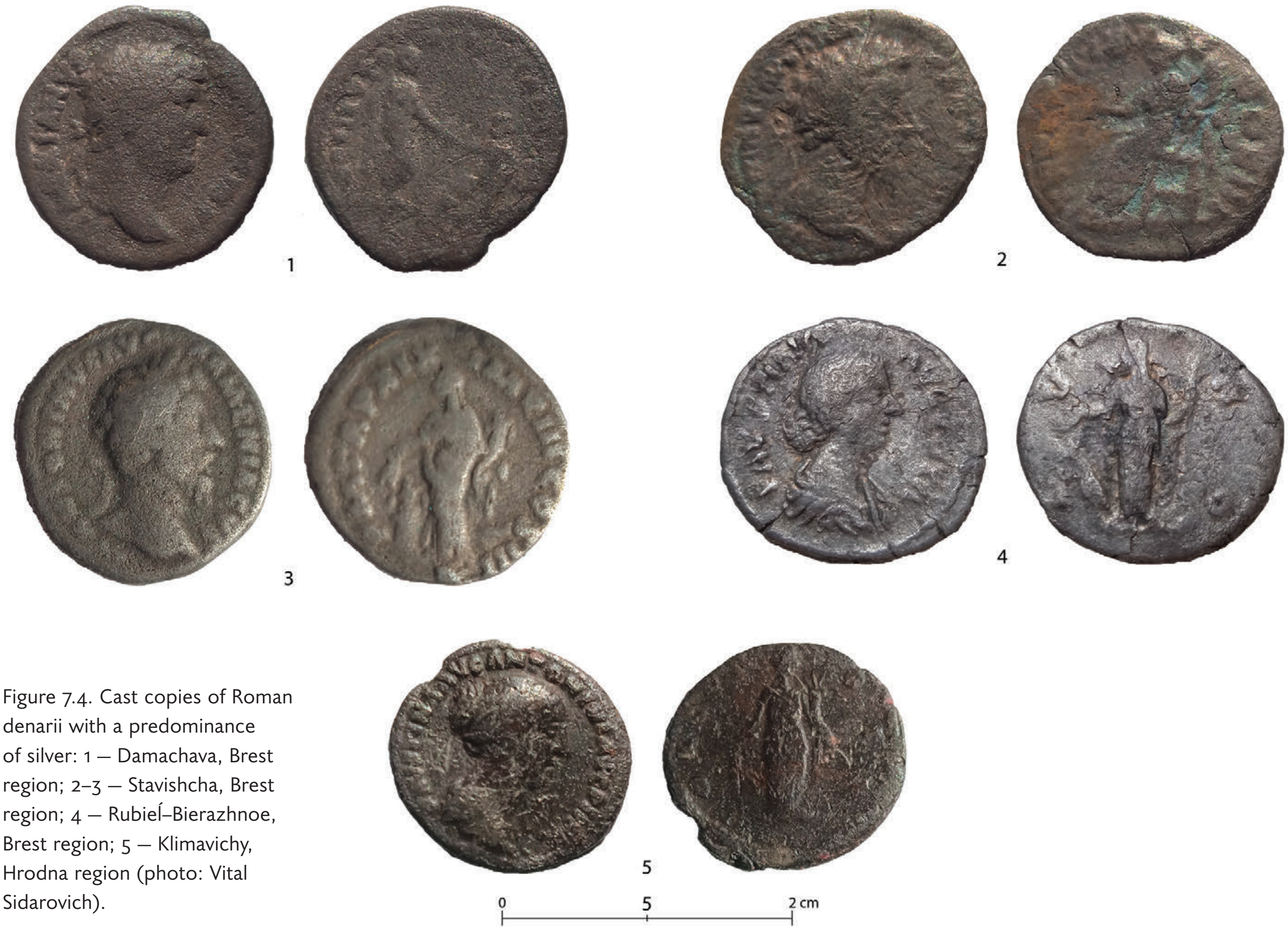

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Figure 7.4. Cast copies of Roman denarii with a predominance of silver: 1 — Damachava, Brest region; 2–3 — Stavishcha, Brest region; 4 — Rubieĺ–Bierazhnoe, Brest region; 5 — Klimavichy, Hrodna region (photo: Vital Sidarovich).

Table 7.4. Elemental composition of coins with a predominance of silver, given as a percentage.

	Location	Catalogue number	Ag	Cu	Pb	Sn	Zn	Fe	Remarks
1	Damachava	7	97.50	0.00	0.89	0.00	0.00	1.61	
2	Stavishcha	16	93.38	2.28	3.33	0.00	0.29	0.71	
3	Stavishcha	13	94.74	2.08	3.18	0.00	0.00	0.00	
4	Rubeĺ–Berazhnoe	33	90.54	7.84	1.06	0.00	0.19	0.36	
5	Klimavichy	39	86.34	3.30	5.04	3.73	0.43	1.15	

Table 7.5. Coins not included in any group, given as a percentage.

	Location	Catalogue number	Ag	Cu	Pb	Sn	Zn	Fe	Remarks
1	Pieski	20	41.45	48.17	8.19	0.04	2.15	0.00	pierced coin
2	Hrushava	2	51.70	19.28	4.87	23.71	0.00	0.45	

predominance of copper) (Myzgin and Kodatskyi 2021, 53–54). The similarity of the pool of the Ukrainian and Belarusian coin finds can be viewed as yet another confirmation that cast coins spread from the Chernyakhiv territory to the territories of its northern neighbours.

Conclusions

Finds of cast copies of Roman denarii (Fig. 7.5) known from the territory of the Wielbark culture in Belarus suggest that its people were very familiar with these coins. We can safely claim that they found their way to the Wielbark environment from the related Chernyakhiv culture, on the territory of which we find centres of production of the cast copies of denarii (Nadvirnyak and Pohorilets 2019, 32–34; Pohorilets and Nadvirnyak 2021, 176–78; and their contribution to the present volume). That these coins passed into the territory of other East Germanic cultures is confirmed by their finds recorded in contexts identified with the Masłomęcz Group (Myzgin 2021, 458–60) and the Przeworsk culture (Dulęba and Romanowski 2018, 81–83).

Not only were the bearers of the Wielbark culture recipients of the output of the Chernyakhiv ‘moneyers’, they were also involved in the redistribution of this output. From the Wielbark culture territory the cast copies of denarii passed into even more distant regions — the basin of the Neman, and the adjacent basins of the Dnieper and of the Dvina. Presumably, these regions were occupied by the Balts, who apparently maintained lively contacts with the Goths. By contrast, in the territory of the Kyiv culture (at least, in that part found in Belarus — in the Homel, Mahilyov regions, and in parts of the Minsk and Vitebsk regions) finds of cast copies of denarii are almost unknown. This despite evidence for the Kyiv culture’s lively contacts with the Chernyakhiv culture. Could this reflect a lack of interest in these coins on the part of the Kyiv culture people? I believe this is a likely explanation.

It is possible that the Wielbark people themselves were making cast denarius copies. Indeed, we have recorded in south-western Belarus, in a Wielbark culture context, a coin which retains some of the casting sprue — a copy of a denarius of Lucius Verus (cat. no. 19) (Sidarovich 2021a, fig. 1.1). On the other hand, this coin was found in the same location with official Roman imperial denarii, suggesting it is an import, and we have no compelling evidence for coin production from the territory identified reliably with the Wielbark culture. The piece of evidence closest to Belarus — a mould for casting copies of denarii of Antoninus Pius — was discovered in Ukraine outside at Symoniv, in the Rivne region (Myzgin 2019, 37 fig. 3), in the upper reaches of the Haryn’ (right-bank tributary of the Prypiat). It is unclear whether this area lay within the range of the Wielbark or the Chernyakhiv culture (Milashevskii and others 2018, 164 figs 1–2; Kozak 1988, 264–65). In any case, if indeed the Wielbark people were familiar with the technology of casting coins, they would have borrowed it from the Chernyakhiv people.

It is a reasonable guess that the cast copies of denarii were not regarded by the bearers of the Wielbark culture (and presumably by their neighbours, the Balts) as equivalent to coins struck from dies — this is suggested by the absence of the former in hoards of Roman denarii, in contrast to struck barbarian imitations, not infrequent in these deposits. The fact that we have no reports on the presence of cast copies of denarii in hoards found in Ukraine suggests that in the Chernyakhiv environment, too, where the production of these coins was organized, they were treated differently than the full-fledged silver coin. Apparently, the bearers of the Chernyakhiv culture did not recognize cast coins as good hoarding material.

That the Wielbark culture people may have attached different value to the cast and struck coins is confirmed indirectly by how easily the former become demonetized. Out of forty-seven cast copies of denarii found in Belarus thirteen are pierced: typically, the hole is near the edge (ten specimens); two coins had been pierced through the centre; one unique coin even has two holes. I am not familiar with statistics on finds of pierced cast denarii found in Ukraine and Poland, but according to Kyrylo Myzgin these coins are regularly recorded on the territory of the Chernyakhiv culture.[6] However, it may be safe to assume that because of their limited purchasing power they tended to lose their status of coinage quite easily, and were converted by their owners into pendants (or something else).

Of special interest in the group of pierced copies of denarii are specimens with 'unconventional' holes. While it is traditional to interpret coins with a hole near the edge as pendants, a coin with a hole made in the centre, and a coin with two holes could have an altogether different explanation. The presence of two holes suggests that a coin could have been sewn onto clothing, especially those specimens that have holes placed closer to the centre rather than near the edge (Fig. 7.5.10). On the other hand, coins with two holes (see e.g. Dymowski 2011, 126 no. P49, coin 141; Anokhin 2015 nos 231 and 234; Bursche and Myzgin 2020, fig. 11: 17, 20) placed near the edge and aligned opposite each other, are most likely to be elements of necklaces, like chain links.

Holes placed similarly as in the coin found at Ucios are extremely rare. The closest analogy known to me is a copper coin with two holes placed close together, found in Ukraine in the Chernyakhiv culture settlement at Khrushcheva Nikitivka, Kharkiv region (Myzgin 2010, 96), and a fragment of a denarius found in Poland at Kołoząb, 60 km north-west of Warsaw (Dymowski 2008, pl. II:32).

As for coins with a central hole, their most likely interpretation is that they are elements of necklaces. At the same time, the way such coins were attached in a necklace suggests a function as beads rather than as pendants. Finds of coins with a hole pierced through the centre seem to very rare outside Belarus too (see e.g. Dymowski 2011 no. P27, coin 48, no. P63, coin 203).

Our elemental composition studies show that cast copies of denarii are a group far from uniform in chemical content. In future we expect to see this category of coins subdivided further into a larger number of groups, to account for coins made of base metal, true fakes, through to coins cast from high-grade silver that are nearly identical in their material characteristics with official imperial Roman denarii, and with 'classic' barbarian imitations. When it comes to the latter, our studies show that the barbarian 'master moneyers' took great care when selecting the metal for these coins (Sidorovich and Ermalitskaia 2021, table. 1). We observed a completely different pattern in the case of the cast denarii. The remarkable lack of uniformity of their elemental composition suggests to me that, not infrequently these coins were made of any material suitable for casting that was on hand.

The above findings suggest to me the existence of more than one tradition in barbarian coin production. We would expect these different traditions to be very similar, but in fact it is not so. Struck imitations were used within the Barbaricum on a par with official Roman silver coin. This is suggested by the regular presence of struck silver imitations in hoards of imperial denarii (Dymowski and others 2020, 204–42).

At the same time, the scale of the production of cast copies was rather impressive (at least, on the Chernyakhiv territory, where finds of these coins occasionally outnumber the regular Roman denarii) (Nadvirnyak and Pohorilets 2019, 31). For the time being the reason for the production of cast coins is still unclear. Many of the barbarian copies made mostly of base metal alloys, were in fact ordinary fakes. But who were they intended for? Not for the inhabitants of the Roman Empire, that is certain, many of these coins differ so obviously from genuine denarii. Naturally, we cannot dismiss the idea of the presence in the Chernyakhiv environment of master craftsmen, skilled in the technique of plating or 'whitening' the cast copies to give them a more 'marketable look'. However, possible traces of such treatment are rarely recorded on cast copies of denarii. In my view, there is nothing to stop us from assuming that there was, in the western regions of the Chernyakhiv culture territory, primitive coin circulation[7] based on Roman imperial denarii. When their supply subsided and then ceased altogether, they became scarce,

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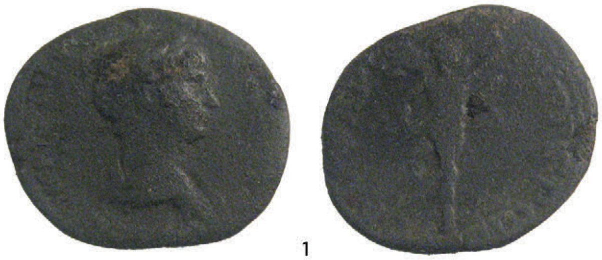
[6] I am indebted to Kyrylo Myzgin for this information.

[7] The term 'circulation' when applied to the barbarian world must be provisional. With a varying degree of confidence we can say that imperial Roman denarii were used as a medium of exchange (i.e. a form of commodity money), and as a popular hoarding item. To date we have no reliable evidence for monetary circulation in the barbarian environment in its classical sense (at least, in most areas of the Barbaricum). The discussion of the role of Roman coins in the Chernyakhiv culture has been going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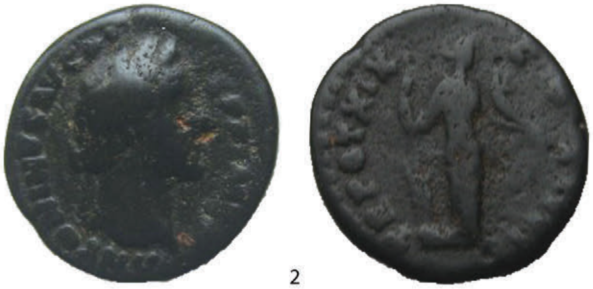
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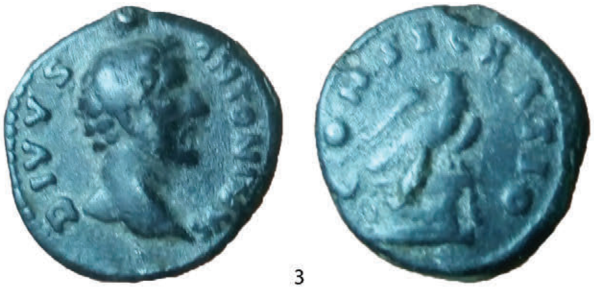

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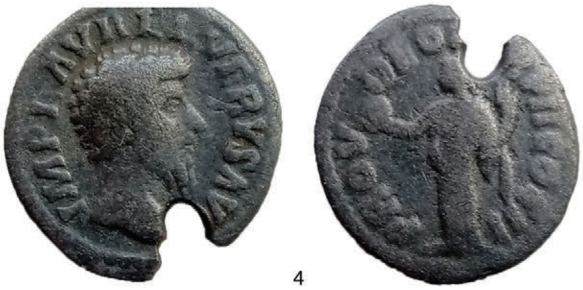
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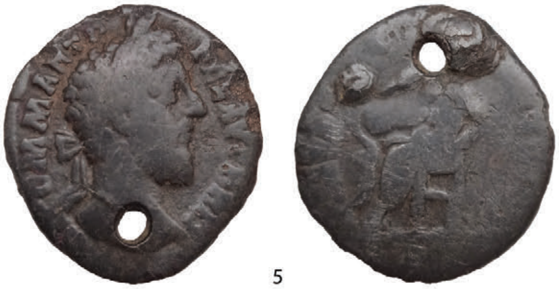
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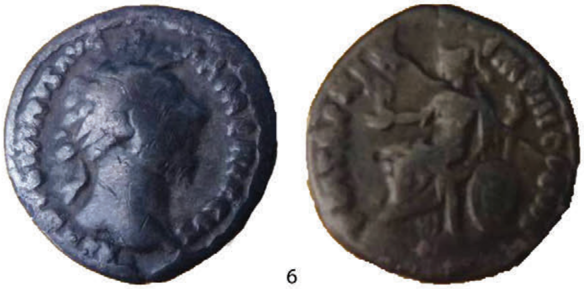
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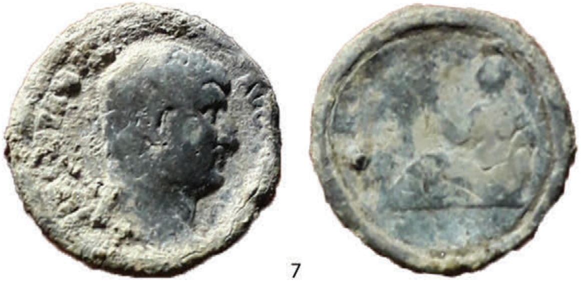
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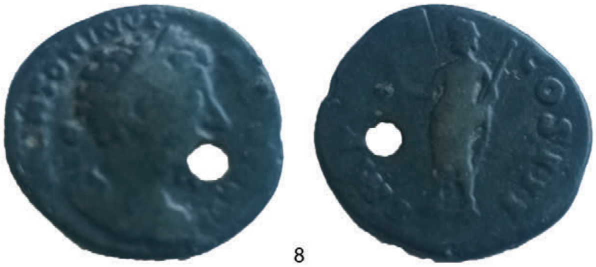
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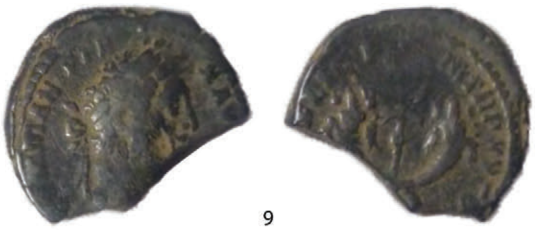
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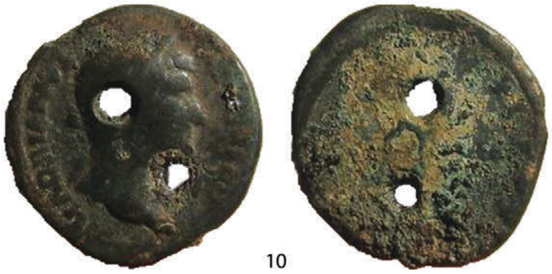
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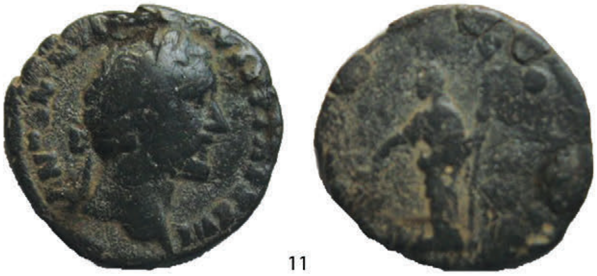
Figure 7.5. Cast copies of Roman denarii: 1, 17 — Dziamianchycy, Brest region; 2 — Stavishcha, Brest region; 3 — Stavy, Brest region; 4 — Hrushava, Brest region; 5 — Pieski, Brest region; 6 — Homsk, Brest region; 7 — Hniezna, Hrodna region; 8 — Slonim (environs), Hrodna region; 9 — Kastryca, Minsk region; 10 — Ucios, Brest region;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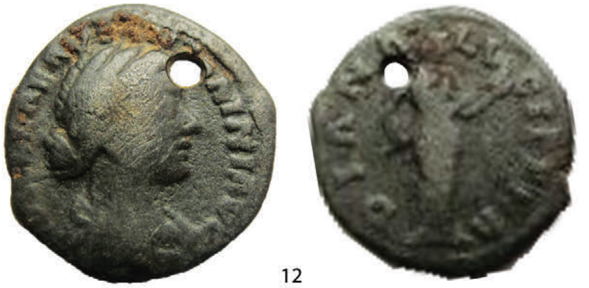
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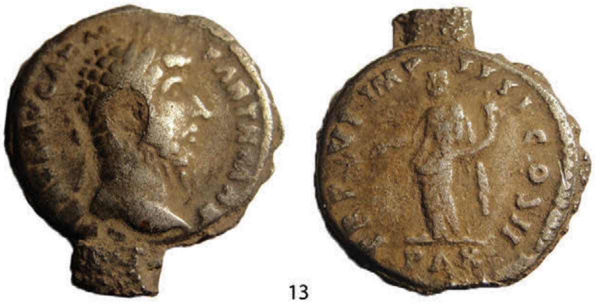
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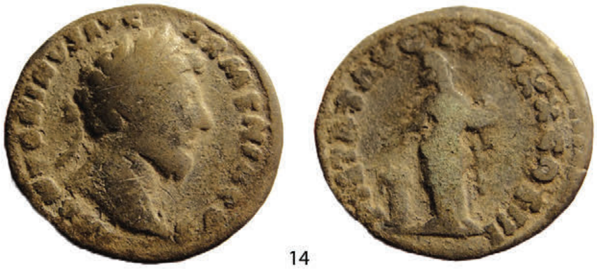
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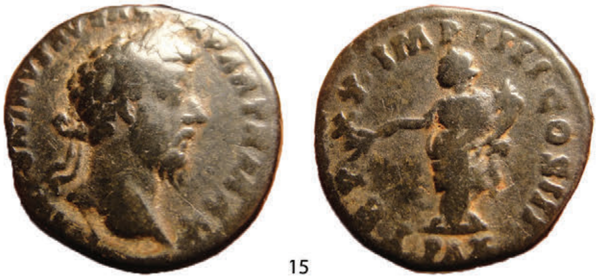
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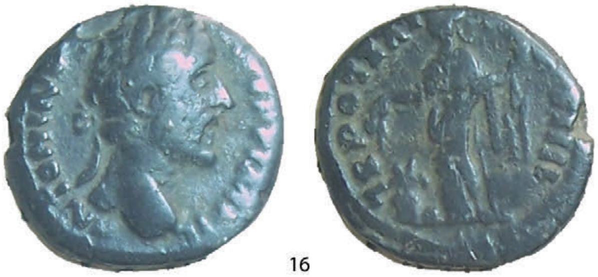
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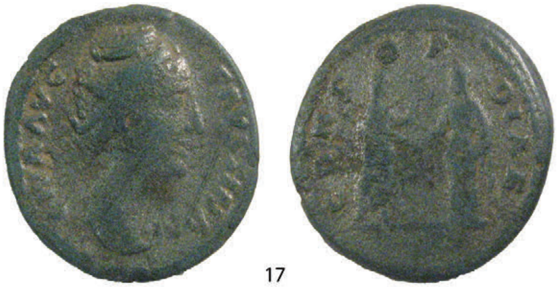
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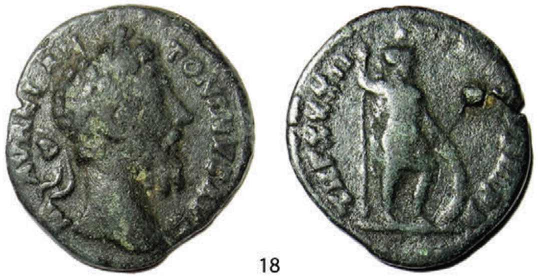
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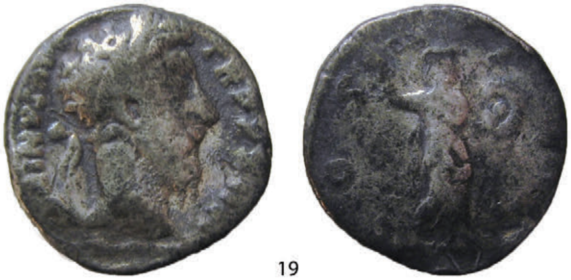
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0 18,19 2 cm

Remain not to scale, approximately 2:1

11 — Slonim (south of town), Hrodna region; 12 — Navasiolki, Hrodna region; 13–14 — Pazhezhyn, Brest region; 15 — Druzhba, Brest region; 16 — Chyzheŭshchyna, Brest region; 18 — Ploshchava, Brest region; 19 — Rubieĺ, Brest region (photo: Vital Sidarovich).

hence the need to produce local copies of this already familiar money. The casting technology chosen for this purpose was traditional in the barbarian environment, unlike minting. Unfortunately, it is less clear why the makers of the cast coins were so indiscriminate in their choice of the raw material. Why such a complete disregard for an important stage in coin production as standardization of the quality of the raw material? Or were some of these coins manufactured from low-grade or base alloy for a special purpose? So far there is no ready answer. All that we can say is that cast copies of denarii were an important part of the material culture of the Chernyakhiv people, and that they were exported to regions at an even greater distance from the Roman Empire, in the first place, to the territory of the related Wielbark culture.

Finally, yet another question still open to discussion concerns the chronology of the production of cast copies of denarii. I am inclined to agree with the view that the beginning of the production of these coins falls in the early phase of the Chernyakhiv culture and to date this phenomenon to the middle of the third century, or somewhat later (Dymowski 2021, 112).

Translated by Anna Kinecka

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on for many years (see e.g. Braichevskyi 1959, 27–34; Tikhanova 1974, 66–73; Myzgin 2008, 71–76; Zinkovskaia 2013, 36–38, etc.), and still there is no consensus.

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Catalogue

Cast Copies of Roman Imperial Denarii from Belarus

No.	Location	Prototype	Analysis	Collection	Publication	Notes
Drainage basin of the Western Bug River						
1	Stavishcha, Brest district, Brest region	Titus (RIC 112–22) or Domitian (RIC 51, 55, 56, 96–92), 80–82	Yes	NC BSU	First-time publication	
2	Hrushava, Kobryn district, Brest region	Trajan RIC 58	Yes	NC BSU	First-time publication	a fragment
3	Yatviesk, Svislach district, Hrodna region	Trajan RIC 128	Yes	NC BSU	Sidarovich and Ermalitskaia 2021, fig. 2: 11	with a hole at centre
4	Dziamianchycy, Kamyanets district, Brest region	Trajan RIC?	No	Private collection	First-time publication	
5	Radasć, settlement site-2, Kamyanets district, Brest region	Trajan RIC?	Yes	NC BSU	First-time publication	a fragment
6	Charnaŭchycy, Brest district, Brest region	Hadrian RIC 209g	Yes	Private collection	Sidarovich and Ermalitskaia 2021, fig. 2: 8	with a hole near the edge
7	Damachava, Brest district, Brest region	Hadrian RIC 324	Yes	NC BSU	Sidarovich and Ermalitskaia 2021, fig. 2: 15	
8	Stavishcha, Brest district, Brest region	Hadrian RIC^2 951	No	Private collection	First-time publication	
9	Brest, vicinity, Brest region	Hadrian (Sabina) RIC^2 2502	Yes	NC BSU	Sidarovich 2021a, fig. 1: 4; Sidarovich and Ermalitskaia 2021, fig. 2: 7	
10	Stavishcha, Brest district, Brest region	Antoninus Pius RIC 251	No	Private collection	First-time publication	
11	Chyzheŭshchyna, Zhabinka district, Brest region	Antoninus Pius RIC 274	No	Private collection	Sidarovich 2021a, fig. 1: 5	
12	Dziamianchycy, Kamyanets district, Brest region	Antoninus Pius (Faustina the Elder) RIC 381ba	No	Private collection	Sidarovich 2021a, fig. 1: 6	
13	Stavishcha, Brest district, Brest region	Marcus Aurelius RIC 142	Yes	NC BSU	Sidarovich and Ermalitskaia 2021, fig. 2: 17	
14	Pazhezhyn, Malaryta district, Brest region	Marcus Aurelius RIC 148	No	Private collection	Sidarovich 2021a, fig. 1: 2	
15	Druzhba, Brest district, Brest region	Marcus Aurelius RIC 164	No	Private collection	Sidarovich 2021a, fig. 1: 3	
16	Stavishcha, Brest district, Brest region	Marcus Aurelius RIC 191 or 209	Yes	NC BSU	Sidarovich and Ermalitskaia 2021, fig. 2: 16	
17	Stavy, Kamyanets district, Brest region	Marcus Aurelius (Antoninus Pius) RIC 431	No	Private collection	First-time publication	
18	Hrushava, Kobryn district, Brest region	Marcus Aurelius (Lucius Verus) RIC 482	No	Private collection	First-time publication	with a hole near the edge

No.	Location	Prototype	Analysis	Collection	Publication	Notes
19	Pazhezhyn, Malaryta district, Brest region	Marcus Aurelius (Lucius Verus) RIC 561	No	Private collection	Sidarovich 2017, 131 pl. 3, fig. 6; 2021a, 71, fig. 1: 1	with a sprue
20	Pieski, Kobryn district, Brest region	Commodus RIC 169	Yes	Private collection	First-time publication	with a hole near the edge
Drainage basin of the Pripet River						
21	Biazvierhavichy, Slutsk district, Minsk region	Trajan RIC 331	Yes	Private collection	Sidarovich and Ermalitskaia 2021, fig. 2: 3	
22	Biazvierhavichy, Slutsk district, Minsk region	Hadrian RIC^{2} 2326	Yes	Private collection	Sidarovich and Ermalitskaia 2021, fig. 2: 4	
23	Biazvierhavichy, Slutsk district, Minsk region	Hadrian RIC^{2} 2326	Yes	Private collection	Sidarovich and Ermalitskaia 2021, fig. 2: 12	
24	Vieliamichy, Stolin district, Brest region	Antoninus Pius RIC 200C or 216Aa	Yes	Private collection	Sidarovich and Ermalitskaia 2021, fig. 2: 9	a fragment (4/5)
25	Raviacichy, Byaroza district, Brest region	Antoninus Pius (Marcus Aurelius), RIC?	No	Private collection	First-time publication	
26	Davyd-Haradok–Vieliamichy Stolin district, Brest region	Antoninus Pius (Faustina the Elder) RIC 361a	Yes	Private collection	Sidarovich and Ermalitskaia 2021, fig. 2: 1	with a hole near the edge
27	Biazvierhavichy, Slutsk district, Minsk region	Antoninus Pius (Faustina the Elder) RIC 381Ba	Yes	Private collection	Sidarovich and Ermalitskaia 2021, fig. 2: 6	
28	Biazvierhavichy, Slutsk district, Minsk region	Antoninus Pius (Faustina the Elder) RIC?	Yes	Private collection	Sidarovich and Ermalitskaia 2021, fig. 2: 5	
29	Homsk, Drahiczyn district, Brest region	Marcus Aurelius RIC 138	No	Private collection	First-time publication	
30	Rubeĺ, Stolin district, Brest region	Marcus Aurelius RIC 211	No	Private collection	Sidarovich 2021a, fig. 1: 8	
31	Ploshchava, Pinsk district, Brest region	Marcus Aurelius RIC 384	No	Private collection	Sidarovich 2021a, fig. 1: 7	
32	Kormuzh, Luninets district, Brest region	Marcus Aurelius (Lucius Verus) RIC?	No	Private collection	First-time publication	
33	Rubeĺ-Berazhnoe, Stolin district, Brest region	Marcus Aurelius (Faustina the Younger) RIC 688	Yes	Private collection	Sidarovich and Ermalitskaia 2021, fig. 2: 18	
Drainage basin of the Neman River						
34	Byĺchycy, Hrodna district, Hrodna region	Titus RIC 108	Yes	NC BSU	Sidarovich and Ermalitskaia 2021, fig. 2: 10	with a hole near the edge
35	Zhyrmuny, Voranava district, Hrodna region	Trajan RIC 147	Yes	Private collection	Sidarovich and Ermalitskaia 2021, fig. 2: 14	with a hole at centre
36	Hniezna, Vawkavysk district, Hrodna region	Hadrian RIC^{2} 1533?	No	Private collection	First-time publication	
37	Ucios, Baranavichy district, Brest region	Hadrian RIC?	No	Private collection	Sidarovich 2021a, fig. 2: 1	with two holes
38	Slonim, vicinity (4 km to the south of the city), Slonim district, Hrodna region	Antoninus Pius RIC 304–05	No	Private collection	Sidarovich 2021a, fig. 2: 2	

No.	Location	Prototype	Analysis	Collection	Publication	Notes
39	Klimavichy, Zelva district, Hrodna region	Antoninus Pius (Faustina the Younger) RIC 500–01	Yes	NC BSU	Sidarovich and Ermalitskaia 2021, fig. 2: 19	
40	Slonim, vicinity, Slonim district, Hrodna region	Marcus Aurelius RIC 282	No	Private collection	First-time publication	with a hole near the edge
41	Vialikiya Reksti, Lida district, Hrodna region	Marcus Aurelius (Lucius Verus) RIC 566	Yes	Private collection	Sidarovich and Ermalitskaia 2021, fig. 2: 2	with a hole near the edge
42	Navasiolki, Hrodna district, Hrodna region	Marcus Aurelius (Lucilla) RIC 763	No	Private collection	Sidarovich 2021a, fig. 2: 3	with a hole near the edge
43	Izbina, Vileyka district, Minsk region	Marcus Aurelius (Lucilla) RIC 781	Yes	NC BSU	First-time publication	
44	Vileyka district, Minsk region,	Septimius Severus (Julia Domna) RIC 577	Yes	NC BSU	Sidarovich and Ermalitskaia 2021, fig. 2: 13	
Drainage basin of the Byarezina River						
45	Kastryca, Barysaw district, Minsk region	Commodus RIC 209	No	Private collection	First-time publication	a fragment
Drainage basin of the Dvina River						
46	Staryja Sharabai, Hlybokae district, Vitebsk region	Antoninus Pius RIC 243	Yes	NC BSU	First-time publication	with a hole near the edge
47	Staryja Sharabai, Hlybokae district, Vitebsk region	Marcus Aurelius? RIC?	Yes	NC BSU	First-time publication	with a hole near the edge

OLEKSANDR NADVIRNYAK AND OLEH POHORILETS

8. Technological Variety of Methods Used in the Production of Cast Copies of Roman Denarii on the Territory of the Chernyakhiv Culture between the Middle Dniester and Southern Bug

ABSTRACT The build up of information related to the production and circulation of cast copies of Roman denarii modelled on first–third-century official types from the territory of the Chernyakhiv archaeological culture has been reinforcing the tendency towards the formation of new information realities, which in some cases encourage the revision of established numismatic schemes and traditional theories. The continuation within the framework of the *Moneta Barbaricum* programme of a regular monitoring of Ukrainian internet resources to track and record new finds, has made it possible to carry on verifying and organizing basic data, and identifying the location of production centres, particularly between the Middle Dniester and Southern Bug. The growing assemblage of cast coins and metalworking debris (sprues, slag), bars of non-ferrous metal — is being used to develop methods of elemental composition study of alloys, and quantitative and qualitative statistical analysis; and also, to encourage their transfer to museum collections. The introduction of new materials related to the production and circulation of cast copies of Roman denarii of the first–third centuries into the scholarly debate, together with a comprehensive analysis of sources, are helping to improve our understanding of the political, economic, and ethno-cultural contacts of the Empire with barbarian tribes on a new factual basis.

KEYWORDS cast copies of Roman denarii, Middle Dniester, Southern Bug

In pre-'revolutionary' (i.e. pre-1917s), Soviet, and Ukrainian historiography, the sources of the supply and routes of the influx of Roman coins, and its place in the processes of the emergence and development of the Chernyakhiv culture in the context of military-political and economic relations between the Roman Empire and barbarian tribal communities of South-Eastern Europe largely remained on the sidelines of research. And, even after the long years of intermittent research, the discussion is far from resolved for almost the entire range of issues related to the spread of Roman coinage to the north-east of the Danube limes (Braichevs'kyj 1959, 4–6; Kropotkin 1961; Pivovarov 1998, 16–30; 1999, 15–35; 2009, 9–19; Magomedov 2006, 46–51; Myzgin 2008, 50–63; 2010, 58–66; 2011b, 142–47; 2013, 217–33; Choref 2012, 152–76; Nadvirnyak and others 2013a, 30–31; 2013b, 11–16; 2013c, 213–19; 2015, 23–24; 2016, 136–50).

At the same time in recent years we have been facing the rise of new information realities, which, in some cases, encourage revision of established numismatic

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schemes and traditional theories. The increasing number of discoveries of single coins, collective finds, and deposits dating to the Roman period (mainly obtained from private metal detectorists), is forcing researchers to test new forms and methodological approaches (Myzgin 2016, 141–45). The introduction into scientific circulation of new materials and a comprehensive analysis of sources are now, in turn, helping us to improve our understanding of the political, economic, and ethno-cultural contacts of the Empire with barbarian tribes on a new factual basis.

In this context we must note that the presence of a significant number of cast copies of denarii in the general pool of coins has been *a terra incognita* in the numismatics of the Roman period in South-East Europe.[1]

Unlike in Western European numismatics (R.-Alföldi 1971, 351–63; Boon 1988, 102–88; Chameroy 2007, 533–72; Gaspar 2015, 31–74; Găzdac 2009, 1487–98; Găzdac and Alföldy-Găzdac 2001, 137–54; Gitler and others 1999, 101–15; Morelli 1990, 109–30; Peter 2004, 19–30), in Central and South-Eastern European coin studies the subject of cast copies of Roman denarii has only attracted the attention of researchers in the last decade (Anokhin 2015; Choref 2012, 152–76), stimulated in a major way by the international project *Barbarian Fakers. Manufacturing and Use of Counterfeit Roman Imperial Denarii in East-Central Europe in Antiquity*.

In addition, work involving the accumulation and introduction into scientific circulation of new materials related to the production and circulation of cast copies of Roman denarii of the first–third centuries AD has been carried out under the auspices of the Ukrainian project *Terra Amadociae* (Nadvirnyak and Pohorilets 2018, 17–21; 2019, 28–41; 2021, 65–68). A priority task still implemented within the *Moneta Barbaricum* programme has been — besides the monitoring of the domestic information space and internet resources to track and record new finds — the verification and classification of the core evidence, the building up of assemblages of artefacts, in this number, cast coins and metalworking debris (sprues, skim, slag), non-ferrous metal ingots, and their analysis and submission to museum collections.[2]

Based on the input from the earlier studies of coin finds preserved in museum and private collections identified as Roman denarii, and on their close inspection, we think it legitimate to distinguish these coins by their production technology — into hammer struck — in imperial and provincial mints — and cast, the latter regarded as products of ancient counterfeiters.[3]

Parallel to these developments, in 2016 the first steps were taken to study the elemental composition of the alloy of the cast denarii and the debris from their production.[4] At the preparatory stage, during the development of the research methodology, the quantitative and qualitative assessment of samples and the formation of a statistical analysis system, a group of thirty-two samples was selected for XRF analyses, mostly intact or fragmented copies of Roman denarii, first-century to first third of the third-century types, recovered in the Khmelnytskyi region and identified by sight as cast coins.

A separate group among them are the so-called 'black'[5] denarii — sixteen complete and eight fragmented

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[1] In Roman-period numismatics several terms are used to describe cast denarii: *limes falsa*, Limes denarii, *frontier forgeries*, *falsa moneta*, etc.; not all of them are appropriate. See also discussion in Chapter 10 in this volume.

[2] Primarily to the SHCR 'Mezhybizh' and the Museum of History and Local Tradition in Dunaivtsi.

[3] Maria R.-Alföldi (1974, 351) describes them as *Fälschungen*, Markus Peter (2004, 106–19) as *inoffizielle Nachahmungen*. Examining them as part of the phenomenon of the spread of cast copies in Roman Britain and other parts of the Roman territory Jenny Hall (2014, 165–94) uses the term *unofficial coin production*. See the similar distinction made by Kyrylo Myzgin in this volume.

[4] The study of the elemental composition of alloys was made with a portable analyser EXPERT Mobile (Institute of Analytical Control Methods, licence *Raytheon Technical Services Company LLC* (USA)). The analyser measures the mass fraction of chemical elements with atomic numbers ranging from 12 (Mg) to 92 (U), contained in solid samples. For more details see: <http://inam.kiev.ua/expert-mobile> [accessed 16 February 2023].

[5] Researchers mostly share the view that 'black' denarii are copies cast of potin — alloy of Cu:Sn:Pb:Zn. And indeed, in the Celtic tradition in particular, in the last centuries BC the use of this alloy was widespread, and coins made of potin had a distribution range extending from the Atlantic to the Baltic coast (Bochnak 2010, 391–419). However, X-ray fluorescence of the tested group of coins recorded a slightly different alloy composition. Instead of the expected Sn and Pb, next to Cu (from 98.332 per cent to 99.176 per cent), XRF detected minor amounts of Ni (from 0.141 per cent to 0.472 per cent), Zn (from 0.227 per cent to 0.269 per cent), Pd (from 0.061 per cent to 0.0318 per cent), and Au (from 0.108 per cent to 0.129 per cent). Other results were obtained from the analysis of 'black' denarii and mirror finds from Balamutivka, Shumivtsi, Mezhybizh and the Stara Syniava district. Next to Cu (from 59.02 per cent to 65.31 per cent) their alloy contained a significant amount of Sn (from 27.34 per cent to 36.58 per cent), Pb (from 1.12 per cent to 4.01 per cent), Zn (from 0.87 per cent to 4.02 per cent), and minor amounts of Ni, Ag, Au, and other elements. We believe that these results may be explained not only by the qualitative and quantitative differences of the elemental composition of alloys sampled for analysis, but also by miscalculations in the research methodology. Incidentally the name 'black denarii' used by us for this group needs confirmation and clarification: e.g. for Mikhail Choref (2012, 158) 'black money' (*moneta nigri*) is the copper-and-silver alloy billon; objects made of this material were treated with a heated solution of NaCl to whiten them by removing copper from the surface. Over time, the copper migrated to the surface and, as a result of oxidation, the coins turned 'black'.

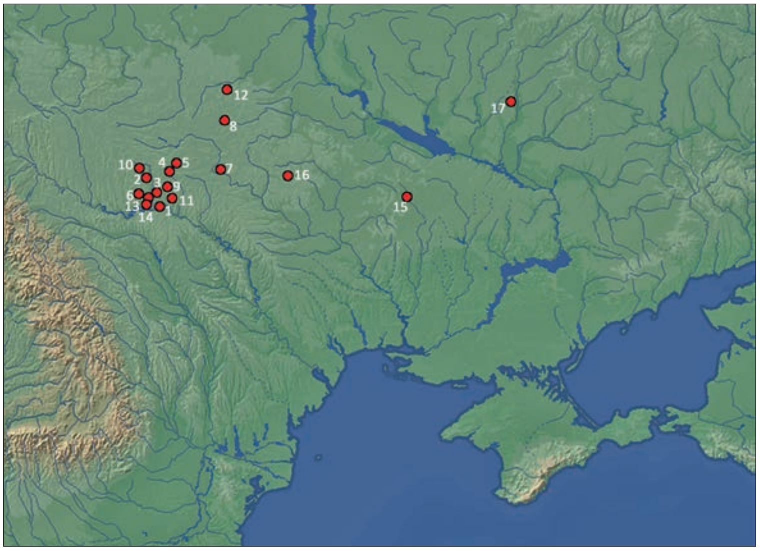
(from Sataniv, Velyka Yaromyrka, Syvorohy, Hanivka, Pil'nyi Mukariv). A similar analysis was made of mirror fragments[6] (from unidentified sites in Kirovohrad and Vinnytsia regions) with Roman denarii cast on their back[7] (Map 8.1).

The results of preliminary analysis confirmed the similarity of the elemental composition of alloys of coins from the group of 'black' denarii and the alloy of mirrors — typical finds at Chernyakhiv culture sites in the territory between the Prut and Dniester, and the Seym and Donets. The similarity of elemental composition of 'black' denarii and mirrors suggests the same production technology and sources of raw material, and consequently, the existence of close economic and production contacts and exchange between individual regions within certain chronological frameworks.

Unexpected results were obtained when the elemental composition determined by the test scanning for alloys of cast denarii was compared with the results obtained for 'grey'[8] denarii, a group which, based on the study results, apparently falls into three subgroups.

In the first case two tested specimens — cast denarii modelled on coin types of Marcus Aurelius (from an unidentified site in Kamianets-Podilskyi district, Khmelnytskyi region), with an alloy composition similar to the elemental composition of alloys determined for the group of 'black' denarii (Cu:Ni:Zn:Pd:Ag:Au), showed a trend towards a decrease in the content of Cu, and an increase in the content of other elements, Zn in particular: Cu (91.181 per cent and 92.789 per cent), Ni (0.205 per cent and 0.136 per cent), Zn (8.941 per cent and 6.069 per cent), Pd (0.12 per cent), Ag (0.459 per cent and 0.682 per cent), and Au (0.102 per cent and 0.194 per cent).

A separate place is occupied by a specimen from an unidentified find-spot in the Dunaivtsi district in the Khmelnytskyi region — a cast denarius modelled on a consecration denarius of Marcus Aurelius, series DIVVS M ANTONINVS PIVS.[9] Obverse: Cu (38.416 per cent), Pd (0.076 per cent), Ag (61.265 per cent), and Au (0.246 per cent); reverse: Cu (44.468 per cent), Pd (0.049 per cent), Ag (55.262 per cent), and Au (0.220 per cent).



Map 8.1. Localization of the places of discovery of cast copies of Roman denarii with traces of the manufacturing processes: 1 — Abrykosivka, Khmelnytskyi region; 2 — Velyka Yaromyrka, Khmelnytskyi region; 3 — Hanivka, Khmelnytskyi region; 4 — Zahintsi, Khmelnytskyi region; 5 — Korzhivtsi, Khmelnytskyi region; 6 — Kormylcha, Khmelnytskyi region; 7 — Klyshchiv, Vinnytsia region; 8 — Ozadivka, Zhytomyr region; 9 — Pil'nyi Mukariv, Khmelnytskyi region; 10 — Sataniv, Khmelnytskyi region; 11 — Syvorohy, Khmelnytskyi region; 12 — an unidentified object in Vinnytsia region; 13 — an unidentified object in Dunayevets district, Khmelnytskyi region; 14 — an unidentified object in Kamianets-Podilskyi district, Khmelnytskyi region; 15 — an unidentified object in Kirovohrad region; 16 — an unidentified object in Nemyriv district, Vinnytsia region; 17 — an unidentified object in Poltava region (according to Oleksandr Nadvirnyak and Oleh Pohorilets; drawing: Kyrylo Myzgin).

However, the least expected results were obtained from XRF-analysis of cast denarii (coin types of Hadrian, Marcus Aurelius, and Alexander Severus), with casting residue, flash, and casting sprues — found in the vicinity of the rural settlement Korzhivtsi (Derazhnya district, Khmelnytskyi region).[10] Every time, the principal component was Ag (between 92.836 and 94.956 per cent) and: Cu (between 4.105 and 4.412 per cent), Ni (between 0.028 and 0.210 per cent), Zn (between

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[6] X-ray fluorescence analysis of the mirrors showed an almost complete match of the elemental composition and qualitative indicators Cu (99.171 per cent and 98.799 per cent), Ni (0.146 per cent and 0.467 per cent), Zn (0.269 per cent and 0.233 per cent), Ag (0.313 per cent and 0.303 per cent), and Au (0.102 per cent and 0.109 per cent) with the parameters of alloys of the coins subjected to the same study.

[7] In addition to Cu (from 53.021 per cent to 61.312 per cent) there was a significant Sn content (from 27.162 per cent to 41.571 per cent), Pb (from 3.420 per cent to 3.720 per cent), Zn (from 0.453 per cent to 3.025 per cent), and trace amounts of Ni, Ag, Au, and other elements.

[8] These coins were identified as 'cast' by the presence around their edges of casting seams and fragments of casting sprues, and on their obverse and reverse surfaces — of defects and dross, additional proof of their local production.

[9] RIC III 272 Commodus.

[10] Finds recovered between 2012 and 2015 on a Chernyakhiv culture site at this location include three complete and three fragmentary denarii retaining the remains of sprues around their edges, proving they had been made by casting. The same location yielded two fragments of sprues of a shape which corresponds to the 'coin tree' casting process, as well as fragments of slag and other metalworking debris (see Fig. 8.1).

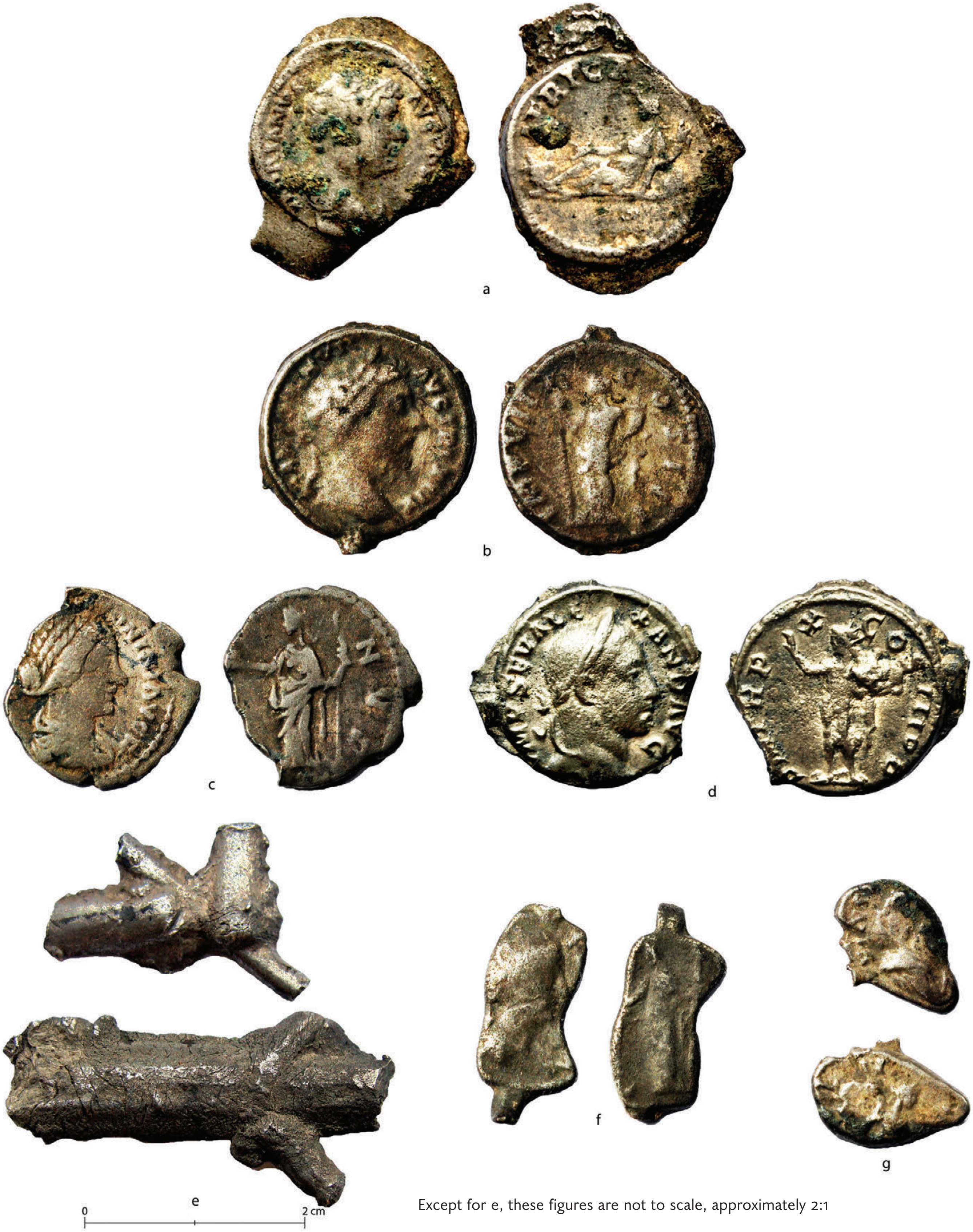

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Figure 8.1. Selected cast copies of denarii and casting sprues from Korzhivtsi, Derazhnya district, Khmelnytskyi region (© SHCNR 'Mezhybizh'; photo: Oleksandr Nadvirnyak).

0.050 and 0.129 per cent), Pd (between 0.594 and 0.650 per cent). The unexpectedly high silver fineness of cast copies of denarii from Korzhivtsi is something apparently absurd for counterfeiting throughout the history of its existence.[11]

What is almost certain today is the local[12] production of the cast copies of denarii high in silver content from Korzhivtsi. This is shown by the discovery at this location of production refuse and fragments of casting slag. Analysis of the elemental composition of the alloy of casting sprues and the production refuse showed a full match with the elemental composition and ratios of individual elements (Ag:Cu:Ni:Zn:Pd:Au) detected in the cast copies of denarii: Ag (between 93.000 and 93.940 per cent), Cu (between 5.119 and 5.530 per cent), Ni (between 0.021 and 0.043 per cent), Zn (between 0.104 and 0.152 per cent), Pd (between 0.056 and 0.060 per cent), Au (between 0.426 and 0.813 per cent).[13]

In 2018 another centre of production of cast denarii[14] was identified in the vicinity of the rural settlement

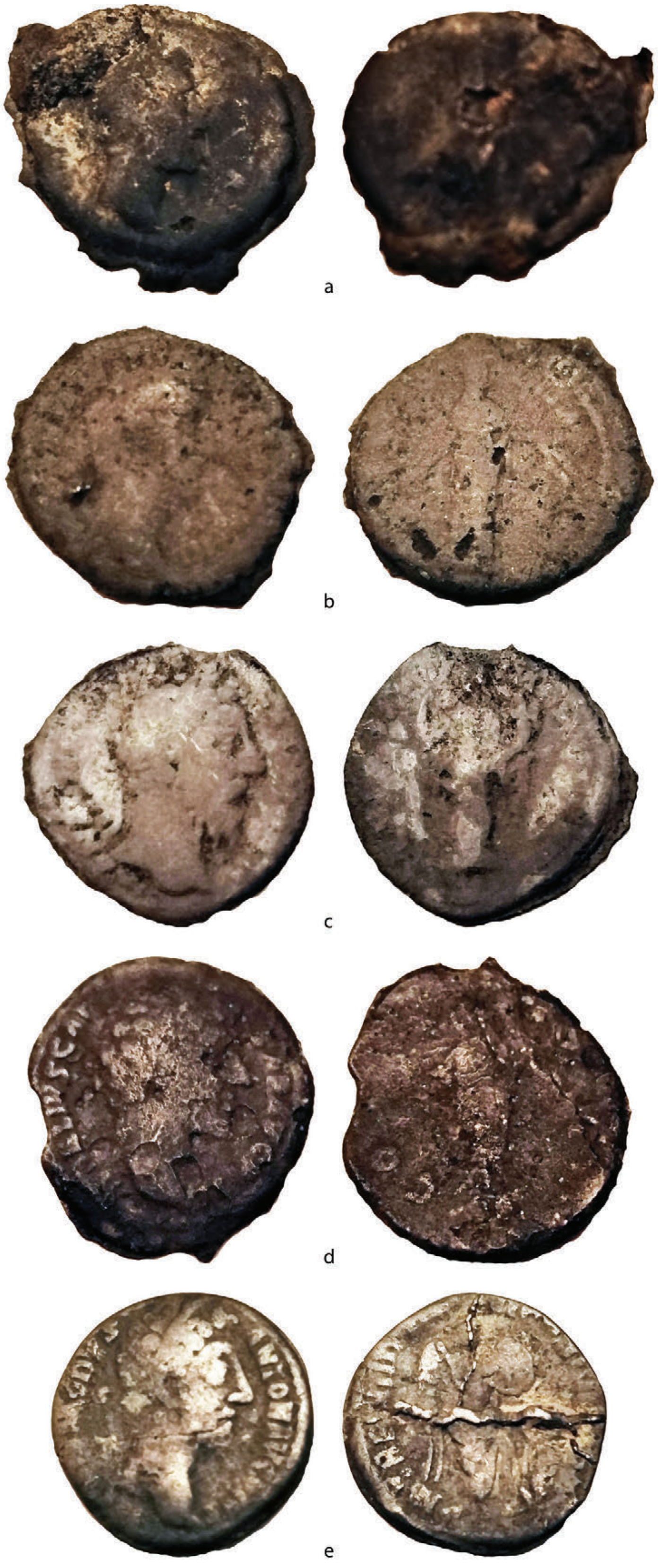

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Figure 8.2. Selected cast copies of denarii from Abrykosivka, Kamianets-Podilskyi district, Khmelnytskyi region (© SHCNR 'Mezhybizh'; photo: Oleksandr Nadvirnyak).

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[11] During the early and late Imperial period the denarius suffered progressive debasement and a reduction of its silver content: for example Liv Yarrow (2012, 423) analysed imperial and provincial coinage of the Antonine emperors and noted a general trend of decline in the weight and fineness of the denarius and analogical denominations.

[12] Serafim Troitskiy (2019, 215) identified several finds identifiable with bronze metallurgy or other activities associated with the working of non-ferrous metals: 'В первую очередь, стоит отметить мастерские, т.е. помещения со специальным оборудованием. В раскопе они обычно читаются как печи или их остатки, они могут сопровождаться остатками несущих конструкций. Ко второй категории можно отнести инструментарий мастера: льячки, тигли, разнообразные инструменты: ювелирные молоточки и наковаленки, резцы, напильники, клещи-кусачки, волочильные доски, пинцеты, а также своеобразная категория инструментария – ювелирные матрицы и литейные формы. В третью категорию можно выделить заготовки и полуфабрикаты для поделок: фольга, проволока, пластины, слитки металла. В четвертую выделяются отходы производства: шлаки, оплавки, бракованные изделия, скопления угля и золы у печей или за пределами мастерских.' (In the first place workshops, that is, areas with special equipment identifiable inside the trench as furnaces or their remains. The second category are metalworking tools: ladles for pouring molten metal, crucibles, various implements: jeweller's hammers and anvils, chisels, files, tongs, drawplates, tweezers, but also jewellery matrices and casting moulds. A third category would be blanks and half-finished products: metal foil, wire, plates, ingots. The fourth [category] is metalworking debris: slag, skim, failed pieces, accumulations of charcoal and ashes near furnaces or outside the production area.)

[13] An additional scan of casting sprues detected minor amounts of Fe (from 0.739 per cent to 0.842 per cent), Sn (from 0.360 per cent to 0.561 per cent), and Pb (0.563 per cent).

[14] In fact, there may have been several workshops at Abrikosivka, this is suggested by three production sites identified at this location, which next to cast copies of denarii yielded slag and metalworking debris with different technological and

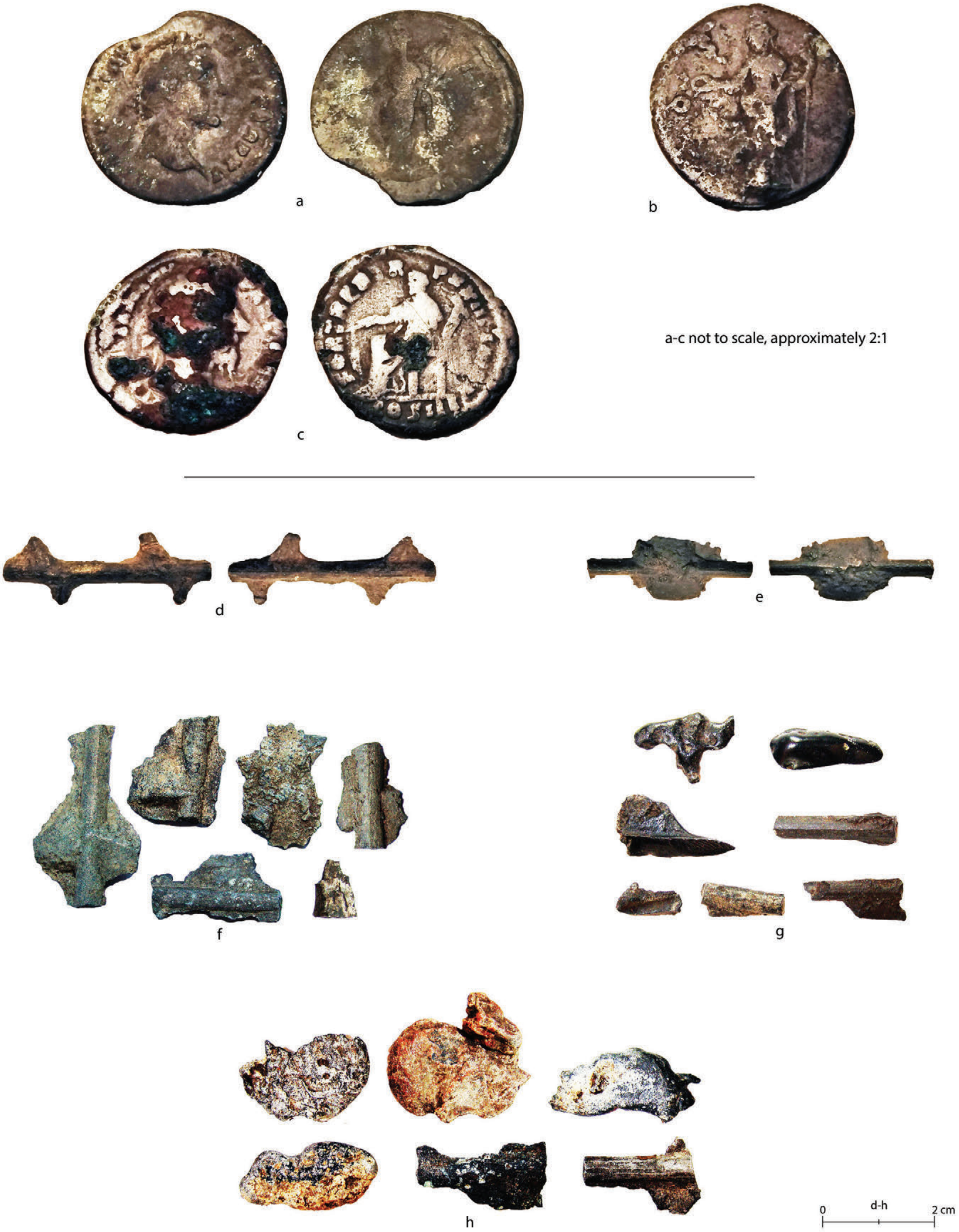
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Figure 8.3. Selected cast copies of denarii and casting sprues from Abrykosivka, Kamianets-Podilskyi district, Khmelnytskyi region (© SHCNR 'Mezhybizh'; photo: Oleksandr Nadvirnyak).

Abrykosivka[15] in Kamianets-Podilskyi district, in the same Khmelnytskyi region. The assemblage of finds from this location includes coins with casting residue, flash, and casting sprues, coins with marks of working on their edges, production refuse, skim and casting slag, as well as fragments of bars/ingots of non-ferrous metal.[16] The results of preliminary scanning of the alloy of some of the casting sprues, coins with casting sprues still attached, and 'refuse' made in 2019 matched the results obtained for cast denarii modelled on types of Marcus Aurelius from an unidentified site in Kamianets-Podilskyi district, Khmelnytskyi region: Cu (between 90.893 and 96.403 per cent), Ni (between 0.106 per cent and 0.276 per cent), Zn (between 0.196 per cent and 8.151 per cent), Pd (0.069 per cent and 0.141 per cent), Ag (0.459 per cent and 0.682 per cent), and Au (0.108 per cent and 0.214 per cent). The addition to the assemblage of finds from Abrykosivka, their visual analysis and selective spectrography, even now makes it possible to distinguish several groups of cast denarii (coin types of Trajan to Commodus), each group with a series of specific features, and quantitative and qualitative composition of alloy,[17] requiring confirmation by additional methods.

In September 2019, in parallel with the work of the thematic section within the framework of the international scientific conference '*Στραωα* and *Μεδος*: Archeology of Life' a study was made of the elemental composition of the metal of objects submitted to the State Historical and Cultural National Reserve 'Mezhybizh' (SHCNR 'Mezhybizh'), and of some materials accepted for temporary storage. One of the tasks was selective scanning of numismatic material from Korzhivtsi and Abrykosivka.[18]

That same year the remains of coin-casting activity were identified on two more sites of the Chernyakhiv culture in the Khmelnytskyi region. Recorded outside the rural settlement Zahintsi in Derazhnya district were four cast denarii[19] with casting residue, retaining casting sprues and casting seams around the edges, fragments of casting slag and metal waste. The assemblage recovered outside the rural settlement Kormylche in Chemerivtsi district comprised cast denarii (coin types of Antoninus Pius, Mark Aurelius, and Commodus) with casting residue, flash, and casting sprues, individual casting sprues, and casting slag.[20]

The group of finds recovered in 2021 in the vicinity of the rural settlement Klishchiv (Tyvriv district, Vinnytsia region), included the remains of a slag-like mass, a cast denarius (coin type of Lucius Verus) with casting seams around the edge, a miscast denarius (coin type of Commodus) with a casting sprue, and a fragment of a casting sprue.[21]

It is remarkable that quite a few of the copies of denarii from Korzhivtsi, Abrykosivka, Zahintsi, Kormylche, and Klishchiv apparently were cast in moulds resembling a tree, using the 'coin tree'/'coin branch' technology, in use during that period in the Near East[22] and Crimea (Choref 2012, 174 fig. 2: 6,

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chemical-physical characteristics (see Figs 8.2 and 8.3).

[15] In a contribution to the V International Scientific Conference 'Actual Problems of Numismatics in the System of Special Areas of Historical Studies', held at SHCR 'Mezhybizh' (Nadvirnyak and Pohorilets 2018, 17–21) the coin assemblage, fragments of casting sprues, and other 'production refuse' were described incorrectly as finds from the rural locality Chornokozyntsi in Kamianets-Podilskyi district, Khmelnytskyi region.

[16] Silver ingots/bars have been encountered in late Roman-period sites in Western and Central Europe (Gałęzowska 2016, 169). Rainer Wiegels (2003, 58–60) suggested that stamped silver bars were used as soldier's pay in the Roman army, especially in the period of the debasement of the denarius. Non-ferrous metal ingot bars recorded at Abrykosivka and in other sites located within the range of the Chernyakhiv culture — at Kalantaiv (Kropotkin 1966, 86 no. 46), Vanzhuliv, Sataniv, Hanivka, Perehinka, etc. — have potential for future studies, not only in the context of numismatic research as currency bars. Finds of rectangular and disc-shaped ingots, both polymetallic (Cu group; Ag group) and monometallic (Cu, Ag, Au, Pb), with specific weight characteristics (corresponding closely or approximately in weight to the Roman *uncia* or ½ *uncia*) and peculiarities in the quantitative and qualitative composition of trace elements, are in need of a study of their sources, routes of influx, and uses in bronze-casting or jewellery production. In fact, this subject has already been addressed by Kyrylo Myzgin (2011a, 132) and Jaroslav Onyshchuk (2018, 321–22).

[17] The preliminary spectral and visual analyses suggest that cast denarii were made not only of copper-based alloy (e.g. black denarii), but also of silver-based alloy.

[18] The studies were made in the archaeological laboratory of the SHCR 'Mezhybizh' under the direction of Oleksander Buhay, Candidate of Physical and Mathematical Sciences (PhD), Head of the Centre for Collective Use 'Accelerator Mass Spectrometer', National Academy of Sciences of Ukraine, using the Elvatech ProSpector 3 portable XRF analyser. Spectrometers of this series are intended for a rapid non-destructive determination of qualitative and quantitative elemental composition of solid and liquid samples. Detection range: Na–U (atomic numbers 11–92). For more details see: <https://elvatech.com/ru/products-2/prospector 3> [accessed 20 May 2023].

[19] Coin type of Antoninus Pius DIVA FAVSTINA (differs from RIC III Antoninus Pius 351: the obverse legend FAVSTINA is fully to the right of the bust), and three coin types of Commodus. Visually, all four coins were cast of copper-based alloys (see Fig. 8.4: a–d). Submitted by Kyrylo Myzgin to the collections of SHCR 'Mezhybizh'.

[20] Visual analysis suggests the use of copper-based alloys (see Fig. 8.4: e–j).

[21] Visual analysis identified two groups of alloys: the cast denarius represents the group of copper-based alloys; the 'incompletely cast' denarius, the sprue fragment and slag-like ingots represent the group of silver-based alloys (see Fig. 8.5: a–e).

[22] In 1994 the Israel Museum added to its collections an assemblage comprising twenty-one cast denarii (coin types of Septimius Severus, Julia Domna, Caracalla, and Geta) and 'production

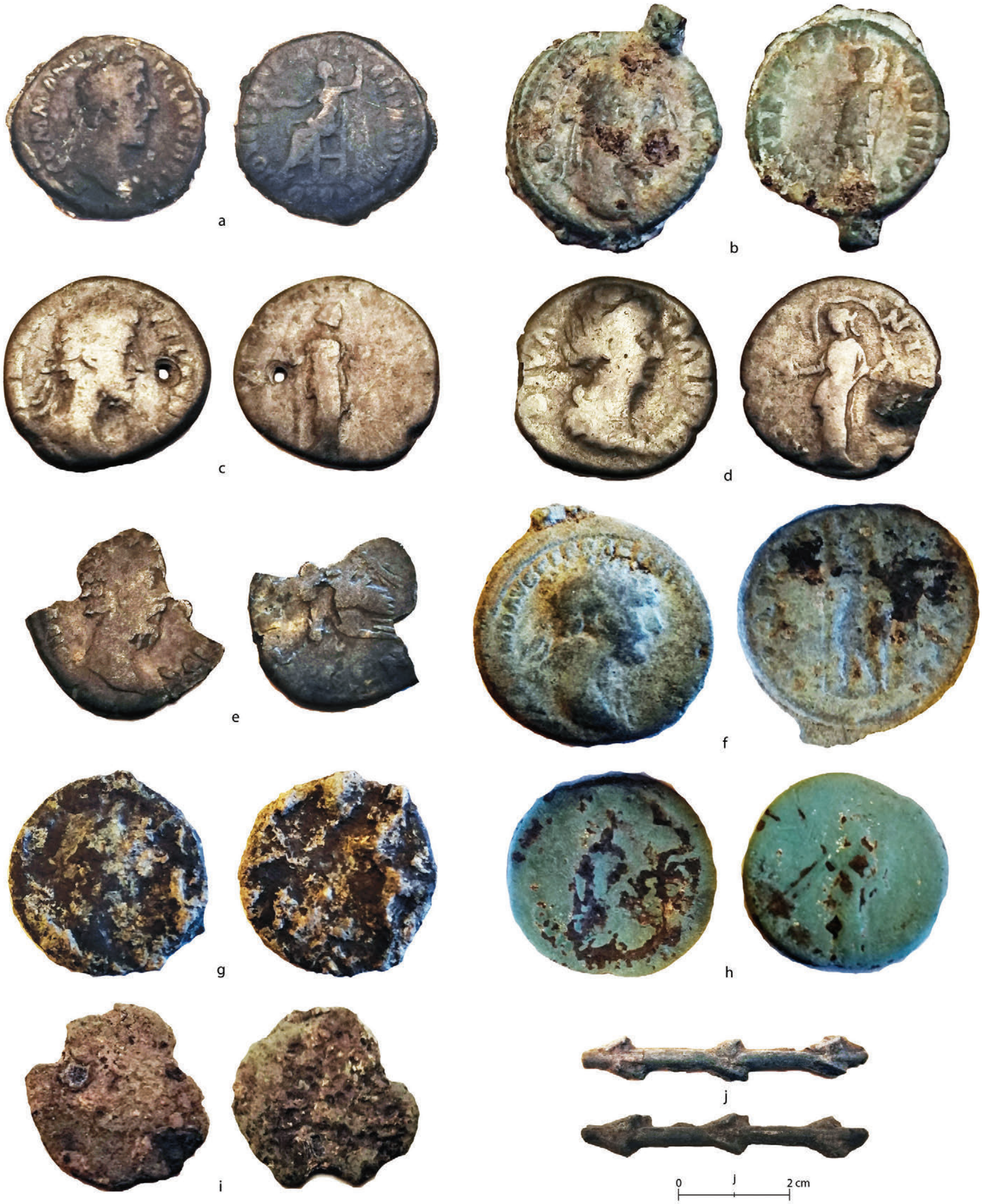

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Figure 8.4. Cast copies of denarii and casting sprues from Zahintsi, Derazhnya district, Khmelnytskyi region (a–d) and Kormylche, Chemerivtsi district, Khmelnytskyi region (e–j) (© SHCNR 'Mezhybizh'; photo: Oleksandr Nadvirnyak).

7). In the latter region the technology may be seen to continue into the early Middle Ages.[23]

By contrast, the technology which seems to prevail in Western Europe was casting in clay moulds that were arranged in 'stacks' (Schiavone 2012, 375–90). This method was widespread in Britain to the north and south of Hadrian's Wall (Boon 1988, 102–88; Holmes 2012, 123–35; Holmes and Hunter 2001, 167–76). Jérémie Chameroy (2007, 533–72) discussed forty-three clay moulds for casting denarii and twenty-five model denarii (coin types of Antonius Pius to Caracalla) from the collection of the Römisch-Germanisches Zentralmuseum (RGZM) provenanced to Western and Central European provinces of the Empire. Jenny Hall (2014, 173) drew attention to the large number of moulds for casting early third-century denarii recovered in the vicinity of Mainz, Risstissen, and Trier (cf. Gitler and Ponting 2000, 532), the area of 'military provinces' (northern Gaul and Germania), where the stationed Roman units could have experienced a shortage of silver money needed to pay the army and make *donative*.

But these are all small fry. The real scale of the production of cast denarii is demonstrated by eight hundred clay moulds for counterfeiting denarii discovered in 1988 on a single site in Roman London (Hall 2014, 165–94; Hall and Goodburn Brown 2015, 123–27), and the number — 2539 — from Contiomagus (Pachten-Dillingen) (R.-Alföldi 1974, 426–47).

Compared to the statistics from Western Europe, the production of counterfeit coins in South-Eastern Europe appears significantly inferior in quantitative terms. Nevertheless, it is too soon to conclude that the latter region lagged far behind the Western European centres.

In addition to centres tentatively identified with the production of cast denarii already known from the Chernyakhiv culture territory, for some time now we have been recording finds of individual coins with the remains of flash and casting sprues, bars/ingots of non-ferrous metal, fragments of slag, and other metalworking debris. Of special interest in this regard are objects related to coin-casting activity which attest to a production technology different from the 'coin tree'/'coin branch' method, and one that is close to the technology reconstructed by Nicholas Holmes and Fraser Hunter (2001, 167–76), Jérémie Chameroy (2007, 533–72), Jenny Hall and Dana Goodburn Brown (2015, 123–27) — a method which used moulds for casting denarii described as *Denargussformen* (Chameroy 2007, 533) or clay coin moulds (Hall and Goodburn Brown 2015, 123).

Oleh Anokhin (2015, 13 fig. 10) published at least three similar coins, one of them determined as a type of a denarius of Trajan. Unfortunately, the type of the only specimen of the three with an identified find-spot (Slavuta district, Khmelnytskyi region) has not been determined. Yet another unattributed cast denarius was recorded in the vicinity of Ozadivka in the Berdychiv district, Zhytomyr region.[24]

Another possible confirmation of the use of the technology of *Denargussformen* would be half a bronze (?) casting mould with the impression of the reverse of a denarius of Antoninus Pius found on the bank of the Horyn River in Hoshcha district, Rivne region (Anokhin 2015, 13 fig. 11).

The use of still other production methods is suggested by single finds related to coin casting which have analogies in the numismatics of the Roman period of Southern and Western European provinces of the Empire. They include:

- a failed bronze (?) casting of two denarii of undetermined type, joined together, one above the other, retaining contours of casting sprues and a flash casting seam at the bottom.[25]
- a failed bronze (?) casting of two denarii determined as obverse type Lucius Verus and Domitian,[26] resembling a two-piece slab-mould with sestertii found at Brigetio (now Szőny in Hungary) (Boon 1974, 108 fig. 1), classified by Andrzej Kunisz (1987, 256) as part of the group of *monnaie de nécessité* or *Notgeld*, necessity money or emergency money.

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refuse'; a 'branch' with an attached coin, puddles, and a riser provenanced to the Levant. The chemical (ED-XRF) and spectrometry (AAS) analysis revealed that the silver alloy coins had a median value of 55.3 per cent silver, *c.* 24 per cent copper, and 20 per cent lead (Gitler and Ponting 2000, 531–39).

[23] In another of Chofer's articles he uses the term 'money tree': cf. Choref 2015, 9–13.

[24] This undetermined cast denarius (diam. — 1.5 cm) retains a roughly spear-shaped casting sprue (length 2 cm, max. diam. 1.1 cm) (see Fig. 8.5: f). The alloy of this artefact contains copper. A closer determination of its composition will be known after a spectrometer study, see n. 5. Pending submission to the collections of SHCR 'Mezhybizh'. The remains of similar cone-shaped casting sprues are observed on specimens published by Oleh Anokhin and on the find from the Slavuta district.

[25] <https://auction.violity.com/103583498-chekanka-limesnogo-denariy> [accessed 20 May 2023]. <https://forum.violity.com/viewtopic.php?t=2119806> [accessed 20 May 2023]. Identifiable as cast in a clay mould. Discovered in the vicinity of Poltava (See Fig. 8.5: g). According to the finder's report, found in a settlement of the Chernyakhiv culture. Pending submission to the collections of SHCR 'Mezhybizh'.

[26] <http://archive.violity.com/l-ver-i-domician-na-bronzovoj-plastine-28750316> [accessed 20 May 2023]; <https://forum.violity.com/viewtopic.php?t=1793116> [accessed 20 May 2023]; from an unidentified find-spot (see Fig. 8.5: h). In a private collection.

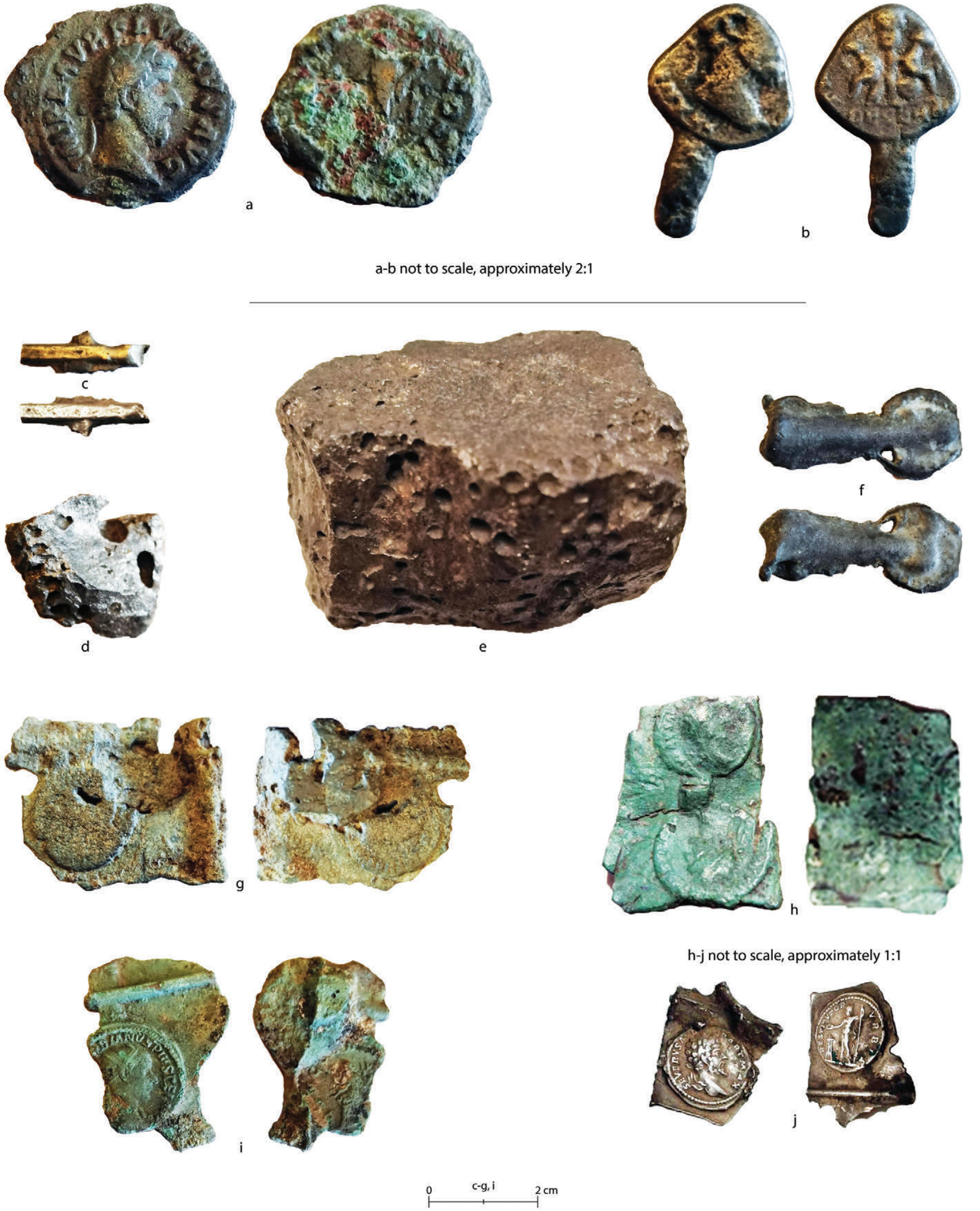
a
b
a-b not to scale, approximately 2:1
c
d
e
f
g
h
h-j not to scale, approximately 1:1
i
j
0
c-g, i
2 cm

Figure 8.5. Cast copy of a denarius, casting sprue, refuse from coin casting, remains of a slag-like mass from Klishchiv, Tyvriv district, Vinnytsia region (a–e), Ozadivka, Berdychiv district, Zhytomyr region (f). Bronze (?) slabs from the vicinity of Poltava (g) and from an unidentified find-spot in Ukraine (h). Bronze (?) slab/slab-mould with an antoninianus of Gordian III from Nemyriv district, Vinnytsia region (i). Silver (?) slab with the obverse and reverse of a denarius of Septimius Severus, possibly from Khmelnytskyi region (j) (© SHCNR 'Mezhybizh'; photo: Oleksandr Nadvirnyak).

- a silver (?) slab with a denarius, obverse and reverse type Septimius Severus.[27] We may assume that the method of casting in slab-moulds is similar to the method of casting mirrors with impressions of denarii which retain the channels of the casting sprues. Presumably the same technology is represented by silver copies of denarii with the remains of slab-moulds found at Korzhivtsi and Pi'lniy Mukariv,[28] and by a bronze (?) slab-mould with an antoninianus of Gordian III.[29]

* * *

The recently amassed data make it legitimate to draw some preliminary conclusions, namely:

The assemblage of finds from Korzhivtsi, Abrykosivka, Zahintsi, Kormylche, and Klishchiv comprising cast denarii and metalworking debris (casting sprues, skim, slag) and ingots of non-ferrous metal identifies these sites as centres of bronze metallurgy and other production activities related to the working of non-ferrous metals, and in particular, to the production of cast copies of Roman denarii.

Their location, as well as the presence of a group of artefacts with a certain set of features, are reason to argue for the local production of cast copies of denarii in our region. At the same time, we think it premature to draw conclusions about the purpose and targets of this production, and about the identity of the people who engaged in this activity.

In its current form the map of distribution of sites where cast copies were produced coincides with the map of distribution of early Chernyakhiv sites in the region between the Middle Dniester and Southern Bug, while the chronology of the operation of these workshops (second half of second–first third of third centuries) is dictated by the currently accepted dating of the lower boundary of the Chernyakhiv culture.[30]

For the time being, the analysis of cast coins, metalworking debris, and casting sprues establishes the primacy of the 'coin tree/coin branch' method. It was used at Korzhivtsi, Abrykosivka, Zahintsi, Kormylche, Klishchiv. Another feature is the prevalence of cast denarii made of a copper-based alloy at Abrykosivka, Zahintsi, and Kormylche, and of cast denarii made of a silver-based alloy at Korzhivtsi, Abrykosivka, and Klishchiv.

On the other hand, bronze copies of denarii retaining a fragment of a cone-shaped sprue found in the Slavuta district and at Ozadivka, the half of a bronze (?) casting mould from the Hoshcha district, the castings with denarii in bronze and silver slab-moulds at Korzhivtsi and Pilnyi Mukariv, are evidence enough to expect future new additions to the list of centres of production of cast denarii on the Chernyakhiv territory, the enlargement of the spectrum of methods used in their manufacture, and the definition of chronological frames for their use.

The building up of collections of artefacts, including cast coins and metalworking debris (casting sprues, skim, slag), as well as ingots of non-ferrous metal, has been contributing to the development of methods of study of the elemental composition of alloys, quantitative, and qualitative statistical analysis.

The publication of new evidence related to the production and circulation of cast copies of first–third-century Roman denarii in our study region, and a continued analysis of the sources at hand must be followed in the future by informed adjustments made to the understanding of the political, economic, and ethno-cultural contacts of the Empire and the 'barbarian' tribes.

Translated by Anna Kinecka

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[27] <https://forum.violity.com/viewtopic.php?t=1384400> [accessed 20 May 2023]; <http://auction.violity.com/32702759-lite-nasliduvannya-na-sribnij-plastini-septimij-sever-denarij> [accessed 20 May 2023]. Possibly from the Khmelnytskyi region (See Fig. 8.5: j). Total weight of the slab — 7.1 g. The original coin type is close to RIC IV.1 Septimius Severus 167 (the obverse legend is different). In a private collection.

[28] Both copies: RIC III Commodus 272. Pending submission to the collections of SHCR 'Mezhybizh'.

[29] <https://forum.violity.com/viewtopic.php?t=2130666> [accessed 20 May 2023]http://auction.violity.com/103916917-zagotovka-antoninian-gordiana-3-plastina. Discovered in Nemyriv district, Vinnytsia region (see Fig. 8.5: i). According to the finder's report, found on a settlement of the Chernyakhiv culture. Pending submission to the collections of SHCR 'Mezhybizh'.

[30] The time of production of cast denarii is established by researchers on the basis of the Roman prototype coin types, most of them of Severan emperors (Gitler and Ponting 2000, 538; Hall 2014, 165–94; Hall and Goodburn Brown 2015, 126; Holmes and Hunter 2001, 169). The phenomenon tends to be attributed to the financial collapse which afflicted the Empire in the first third of the third century. Presumably, the presence of a significant (if not prevalent) number of cast denarii (coin types Antoninus Pius and Marcus Aurelius) on the territory east of the Dniester corresponds to the financial crisis of the Marcomannic Wars, which, in principle, is illogical for the events connected with the currently accepted chronology for the Chernyakhiv culture.

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9. Elemental Composition of Cast Copies of Denarii and Related Production Waste from Ukraine Determined Using PIXE and XRF Methods

ABSTRACT The article discusses the results yielded by Particle-induced X-ray emission (PIXE) and X-ray fluorescence (XRF) analyses made between 2019 and 2021 of cast copies of Roman denarii and waste from their production recovered in Ukraine. Despite significant differences of methodology these results may in general be regarded as comparable. Attention is drawn in particular to the relative homogeneity of the elemental composition of copper-tin alloys of the finished coins.

KEYWORDS Particle-induced X-ray emission (PIXE), X-ray fluorescence (XRF), cast copies of Roman denarii, Chernyakhiv culture

In 2019–2021 the Institute of Applied Physics, National Academy of Sciences of Ukraine (NAS), performed a series of analyses of the chemical composition of the metal of cast copies of Roman denarii and waste from their production recovered on the territory of Ukraine. Two methods were used: X-ray fluorescence (XRF) and Particle-induced X-ray emission (PIXE) depending on whether the samples were available for laboratory (stationary) analysis, as required by PIXE, or had to be analysed outside the laboratory, in which case the method used was XRF, carried out with a handheld device. Below we report in brief on this research and the results obtained.

Samples

A total of fifty-seven samples were analysed, originating from nine locations: Abrykosivka — twenty-two samples, Klishchiv — three samples, Ozadivka — one sample, Vinnytsia region/no precise location — two samples, Chan'kiv — five samples, Hanivka — four samples, Pil'nyi Mukariv — twelve samples, Syvorogy — eight

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samples. Analysis was made of the metal of cast copies, and waste from their production. The specimens from Abrykosivka (Khmielnytskyi region), Klishchiv (Vinnytsia region) and Ozadivka (Zhytomyr region) derive from workshop sites identified with the production of cast copies (Pohorilets and Nadvirnyak 2022, 7) and include finished objects, sprues, and production waste. The remaining samples represent individual coins from find-spots in the Vinnytsia region (without precise location) and the Khmielnytskyi region (Chan'kiv, Pil'nyi Mukariv, Syvorogy, Hanivka) (cf. Nadvirnyak and Pohorilets 2019, 32).

Methodology

PIXE analytical technique. PIXE was used chiefly for coins recovered from workshop sites identified with the production of cast copies of Roman denarii (Table 9.1). Analyses were carried out on an analytical accelerator complex at the Institute of Applied Physics in Sumy. The application of the PIXE method in the study of archaeological samples was described in some detail, also by one of the authors of the present text (Buhay and others 2015; Lyubichev and others 2021, 16 and following literature). Briefly speaking, PIXE is based on the interaction of charged particles (protons and helium nuclei) with matter. X-ray radiation generated in the process is used to identify chemical elements and calculate their concentrations. The technical implementation of the PIXE technique consists in directing a proton beam with an energy of 1 MeV from the accelerator into the scattering chamber and next, through the collimator with a hole with a diameter of 1 mm onto the sample surface. As a next step, the characteristic X-ray was detected with a detector (Amptek XR100-SDD) placed at an angle of 45° from the sample surface. The surface charge was measured with the current integrator. To improve the accuracy of the elemental analysis of unknown samples use was made of standard samples of pure metals, alloys, and clays with a known composition ISE 952 1. The concentration of elements from the obtained spectra was calculated using the software package GUPIX (Campbell and others 2000). Every sample was measured three times. Results were averaged. If necessary, components of complex objects were analysed separately from each other (cf. Lyubichev and others 2021, 16).

XRF analytical technique. This method was used to investigate elemental composition of separate finds of cast copies of Roman denarii (Table 9.2). Measurements were made with a handheld X-ray fluorescence analyser Elvatech ProSpector 3 with a detection range Na–U (Sodium to Uranium). The source of X-ray radiation was a Rh (rhodium) anode tube, accelerating voltage — up to 50 kV, current — up to 200 μA. Spectra were obtained with detector FastSDD (25 mm^2). Analysis was carried out using a laboratory stand for small and friable samples. There was no preliminary preparation of samples. Three measurements were taken of each, and the average value calculated. Quantitative evaluation of chemical elements was made using the Fundamental Parameter Method (FPM). The results were verified and corrected selectively using reference material of known composition.

PIXE and XRF compared. The PIXE technique has a number of advantages over other analytical techniques. In particular, higher sensitivity (several ppm or more); speed (a few minutes per sample); non-destructive nature; multi-element analysis capability (almost the entire periodic table is covered by a single analysis with small variations in sensitivity); spatial resolution (with a microbeam resolution of ~ 1 μm); versatility (can be used for almost all types of object); ability to obtain two-dimensional mapping, etc. (Buhay and Myzgin 2020, 39–40). The main advantages of XRF technique include its non-invasiveness, portable equipment enabling testing in the field, and the relatively high speed of analysis (three–five minutes per sample). However, unlike PIXE, the portable XRF technique has limitations in the beam collimation. This limits the choice of the analysed spot, which means that, for example, contaminants on an unprepared sample can significantly influence the results obtained. Generally, the results of these two methods are comparable, except that in the overall analysis the lower sensitivity of the XRF technique must be taken into account.

This is shown in particular by a case where XRF analysis of some samples revealed high concentrations of silicon (in some samples, over 30 per cent). Considering that the content of silicon is comparable with concentrations of other elements detected, known to be abundant in the Earth's crust (Al, Fe, Ti, etc.), and that no prior preparation of samples had been made, it is legitimate to interpret these elements as impurities, collected on the subsurface layer of coin when they were in the ground, or as manufacturing defects. To confirm which of these two interpretations is the correct one we have to take into account the ratio between element concentrations.

Results

Based on their elemental composition the analysed samples fall into three groups: alloys in which the key element in terms of content is copper, tin, or silver.

Alloys with a dominance of copper were in the majority in the group of finished artefacts, and made up only a minor percentage in the group of objects identified with the production of cast copies. The sample from Pil'nyi Mukariv (Table 9.2: 11) is almost pure copper (98 per cent), but in most samples the concentration of copper was in the range of 30–65 per cent. Tin was the main alloying element (concentrations of 18 to 39 per cent), but lead as well (from 2 to 16 per cent), and to a much lesser extent — zinc (up to 4.79 per cent). Where the third element has a content of more than 5 per cent the material of the sample may be said to be a three-element alloy or gunmetal, in the classification of David Dungworth (1995). As indicated earlier, significant levels of silicon (up to 31 per cent) in samples with a predominance of copper are most likely due to the fact that a number of samples had not been pre-treated. This also applies to the presence of aluminium (up to 7.75 per cent)

The majority of samples with tin as the main component are found in the group of production waste, and to a lesser extent — among the coins. Tin concentration values typically range from 34 to 71 per cent, with copper as the main alloying element (between 8 and 44 per cent). Significantly lower concentrations were determined for lead.

Samples of alloy with a predominance of silver are in the minority: there are just three, with a high silver content, between 83 and 89 per cent. The main alloying element is copper (from 3.58 to 13.65 per cent). One sample only (Table 9.2:1) included gold (0.8 per cent), in this case, most likely to be a companion element to silver.

A separate group are samples in which the main element is lead (Table 9.1: 9, 20), silicon (Table 9.1: 26), or aluminium (Table 9.1: 4). All of them are associated with the process of production of cast copies of denarii.

Discussion

Essentially, the vast majority of the analysed samples belong in the group of bronzes, i.e. copper-tin alloys, the ratio of these two elements at mostly 1:2, less often, 1:3, and even less often — nearly 1:1. These differences in the Cu:Sn ratio affected the colour: where the tin content exceeded 20 per cent, and was second only to copper, the colour of the alloy was silvery; the lower the content of tin — the more yellow the colour of the coin (Mödlinger and others 2017, 22, table 2). In fact, objects manufactured from alloys of this description appear to be made of low-grade silver (Fig. 9.1: h, j, k, l; 2: b, c, e). Where tin was the dominant element in the alloy its colour was in the grey range (Fang, McDonnell 2011, 56–57), this is also confirmed by some of the analysed finished coins (Fig. 9.1: g, i; 2: d, g). Lead was added to these alloys to increase ductility, but its raised content (over 10 per cent) could result in a finished product with a rather dark colour (Fig. 9.2: f).

The study of finished coins and production waste from two casting workshops (Abrykosivka and Klishchiv; Table 9.1; Fig. 9.1: d, e, f) revealed that the two groups had similar elemental compositions, something which on the whole was already rather obvious. At the same time the elemental composition of at least two sprues from Abrykosivka was different: one of them had a very high content of silicon and aluminium (Table 9.1: 4), the other — a very high level of lead and silicon (Table 9.1: 9). Presumably, they can be identified with a defective batch. In fact, the specimen from Abrykosivka interpreted as production waste appears to be raw tin (54.04 per cent; Table 9.1: 20).

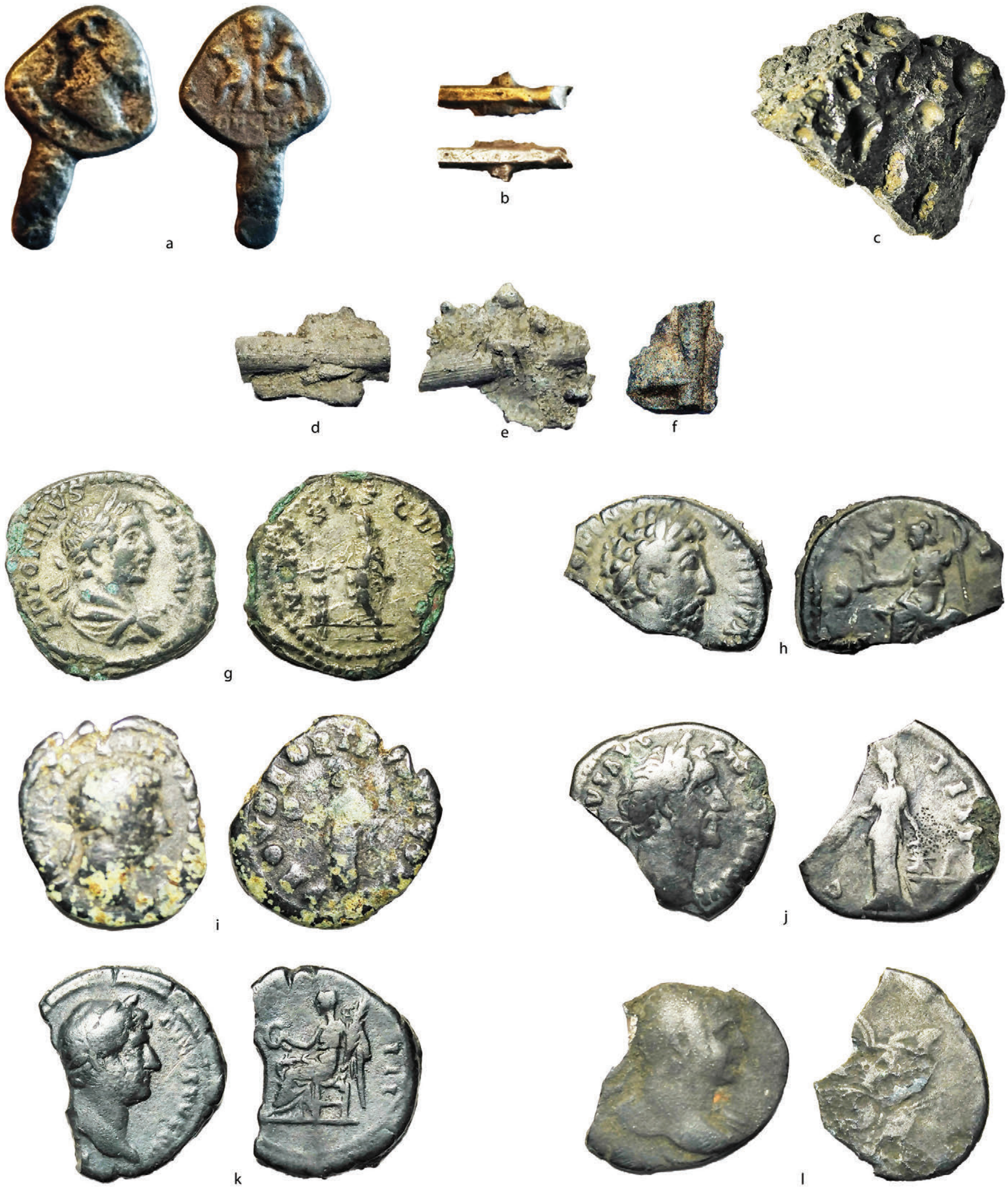
Interesting results were obtained for the material from Klishchiv where the coin and sprue were found to be of relatively high-grade silver (Table 9.1: 2, 13; Fig. 9.1: a, b), while a specimen from the same site, interpreted as production waste, has silver content at 0.04 per cent, iron and silicon making up nearly 92 per cent (Table 9.1: 26; Fig. 9.1: c). Very likely, this find has nothing to do with the manufacture of cast copies of denarii in that workshop, only with some other metalworking process. Nevertheless, it is remarkable that according to its finder this specimen was found right next to the counterfeiting remains, suggesting cast copies were produced in metalworking workshops. A fairly unexpected result was high silver content detected in the coin from Chan'kiv (Table 9.2: 1). This coin appears to have been in the fire (Fig. 9.2: a) and was provisionally identified with the production of barbarian counterfeiters. Perhaps this is an original, fire-affected denarius, or a plated coin, possibly retaining traces of plating on the reverse. It its case too we must take into account that this coin was investigated by XRF techniques, and the results were obtained from the surface and thin near-surface layer of this specimen.

In general, the compositional analysis of finds from production sites and single finds revealed relative homogeneity, which suggests that the ancient masters took some pains to adhere to specific recipes

Conclusions

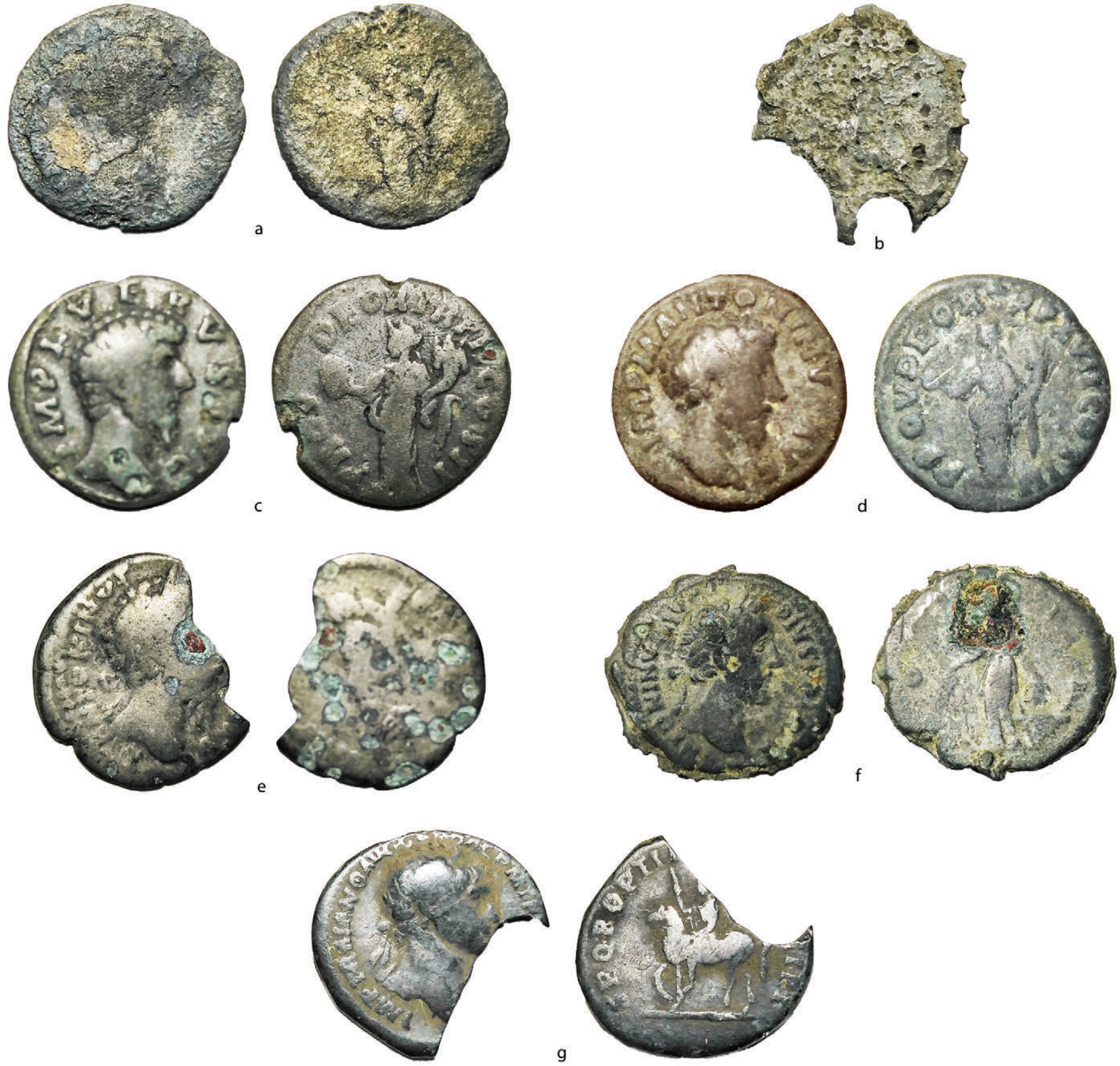
Despite the relatively small selection of samples tested for finished cast copies of Roman denarii and for finds identified with their production, and moreover, the application of two different analytical methods, some fairly interesting results have been obtained.

First, the relatively homogenous elemental composition of the finished artefacts of copper-tin alloy suggests ancient craftsmen adhered to similar recipes, and at the same time, took pains to ensure their wares



Not to scale, g-l approximately 2:1

Figure 9.1. Samples submitted to PIXE analysis (a–g) and XRF methods (h–l): a–c — Klishchiv, Vinnytsia region; d–g — Abrykosivka, Khmelnytskyi region; h–k — Pil'nyi Mukariv, Khmelnytskyi region; l — Chan'kiv, Khmelnytskyi region (photo: Oleksandr Nadvirnyak).



Not to scale, approximately 2:1

Figure 9.2. Samples submitted to XRF analysis: a – Chan'kiv, Khmelnytskyi region; b, g – Pil'nyi Mukariv, Khmelnytskyi region; c, d – Hanivka, Khmelnytskyi region; e – Syvorogy, Khmelnytskyi region; f – Vinnytsia region (photo: Oleksandr Nadvirnyak).

were as similar as possible to original denarii in colour. Some specimens with a high silver content reflect an entirely different strategy in the production of cast copies of denarii. These results largely corroborate earlier observations based on an earlier XRF study of a larger coin series from Ukrainian finds (Nadvirnyak and Pohorilets 2019, 32–34; Pohorilets and Nadvirnyak 2022, 6–7).

Second, an observation was made that some specimens previously regarded as debris from the production of fake coins may in fact be identified with other types of metalworking, something to which we must pay more attention in future.

In general, despite obvious advantages of PIXE over XRF mostly related to measurement sensitivity, accuracy, and depth, the results obtained from these two methods are comparable. Nevertheless, the problem of the preparation of samples for analysis remains relevant, as noted in past research (cf. La Niece 1998, 115–17). The assumptions made here will be tested by further analyses of cast copies of Roman denarii and the remains of their production.

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Table 9.1. The results of elemental analyses of samples tested with PIXE.

No	Find-spot	Cu	Sn	Pb	Zn	Ag	Fe	Si	Al	P
Finished products										
1	Abrykosivka	30.4742	50.63	1.7485	0.1848	4.2738	0.3807	6.7497	2.8359	1.4404
2	Klischiv	4.1715	0.8219	0.07601	0	89.6439	0.1299	3.3241	0.7118	0
3	Vinnytsia region 1	15.5634	34.5562	9.4654	0.6848	0.1707	1.3355	23.1952	8.1638	3.4645
Sprues										
4	Abrykosivka	1.2677	1.109	6.4052	0.0353	0.02253	2.0407	35.1096	38.2882	9.7421
5	Abrykosivka	40.7252	32.793	3.5996	4.6949	0	0.7522	9.6537	4.6763	1.2015
6	Abrykosivka	43.9632	27.4166	1.5412	2.835	0.08231	0.6997	13.3007	6.7709	1.2318
7	Abrykosivka	42.4648	31.7359	2.9954	3.069	0.04563	0.6748	10.8872	5.0988	1.4631
8	Abrykosivka	8.581	63.3056	4.5386	0.9293	0.06634	0.7311	11.479	6.4973	2.3367
9	Abrykosivka	1.5333	12.5876	35.0532	0.3664	0	1.5493	20.4095	6.9282	9.554
10	Abrykosivka	9.4226	71.0108	3.3446	0.02336	0.1399	0.6799	9.3398	4.1253	0.9934
11	Abrykosivka	29.724	29.0461	9.2947	1.4668	0.1194	0.8886	16.6753	6.5253	3.5884
12	Abrykosivka	33.9097	42.6427	9.3139	0.2917	0.1203	0.4183	4.2582	2.9381	4.0637
13	Klischiv	3.5877	1.0533	0.1303	0.03629	83.7517	0.65	9.8398	0	0
Production waste										
14	Abrykosivka	42.9817	41.9254	6.6114	1.2657	0	0.1599	2.164	1.4583	2.0486
15	Abrykosivka	49.5307	37.1418	1.8664	0.5459	0.3065	0.2259	5.5319	3.0077	0.8844
16	Abrykosivka	44.7446	46.7668	3.1051	0.1463	0.09896	0.2588	1.4274	0.6977	1.7553
17	Abrykosivka	50.3031	38.0747	1.7321	4.7924	0.2266	0.3667	1.5211	0.4761	1.254
18	Abrykosivka	73.0502	0.1671	1.5852	1.3018	0.03722	0.7347	14.1528	7.0865	0.6024
19	Abrykosivka	40.9876	41.8689	2.4983	0.1253	0	0.3678	7.838	4.4183	0.7745
20	Abrykosivka	0.7776	1.5581	54.0443	0.06676	0	1.0517	14.7895	5.2087	10.9809
21	Abrykosivka	24.0229	64.9334	2.407	0.275	0	0.6306	3.1889	2.324	1.3853
22	Abrykosivka	2.45	65.5897	7.7069	0.1865	0.09998	2.4054	10.524	5.7611	2.612
23	Abrykosivka	39.4473	43.0683	0.9004	0.5166	0.295	1.0758	7.6431	4.8871	0.8597
24	Abrykosivka	32.195	42.4713	2.2741	1.6997	0.1154	0.6499	13.3246	4.6738	1.1116
25	Abrykosivka	30.5687	43.4005	5.2987	0.09268	0.1419	0.7261	9.736	5.4843	2.6433
26	Klischiv	0.9078	0.2876	0.1905	0.08742	0.04416	41.191	50.664	4.5445	0.09086
27	Ozadivka	22.4744	43.0099	11.1744	3.6825	8.6317	2.2148	2.3499	1.8906	2.6765

Ca	S	Cl	K	Sc	Ti	V	Cr	Mn	Co	Ni	Sb
Finished products											
0.3562	0.2686	0.4136	0.125	0	0.09853	0	0.006546	0	0	0.03241	0
0.2246	0.1612	0.3577	0	0	0	0.003473	0.01395	0.4389	0	0	0
1.1037	0	0.702	1.3049	0	0.2801	0	0.007674	0.01312	0	0.01939	0
Sprues											
3.5337	0	0.3051	1.6625	0.04649	0.2729	0	0.01504	0.125	0.008373	0.01948	0
0.6197	0.08964	0.1342	0.304	0	0.103	0.005887	0.01177	0	0	0.132	0
0.6711	0.1966	0.163	0.3992	0	0.1277	0	0.04481	0	0.03623	0.1354	0
0.7429	0	0.2467	0.3879	0	0.1124	0	0	0	0	0.07769	0
0.614	0	0.2202	0.325	0.08663	0.1646	0	0	0	0.02106	0.1253	0
1.5513	0	1.4976	1.1139	0	0.2525	0	0.04274	0.00286	0.05599	0.1014	6.9037
0.3582	0	0.1135	0.2396	0	0.169	0	0.03096	0	0	0.03353	0
1.3478	0	0.3435	0.5703	0	0.1854	0	0.007092	0	0	0.03368	0
1.2138	0	0.4379	0.1905	0	0.04994	0.009552	0.03432	0	0.01586	0.1137	0
0.1476	0.05732	0.318	0	0.03068	0.1779	0.0636	0	0.06645	0.03741	0.01192	0.06525
Production waste											
0.774	0.06076	0.2915	0.08998	0	0.07353	0.009394	0.002427	0.02102	0	0.07841	0
0.3977	0.1571	0.1081	0.1328	0	0.05443	0	0	0.01164	0	0.1044	0
0.7417	0	0.2055	0	0	0.04774	0	0	0.001706	0	0.0122	0
0.7911	0.06035	0.1415	0.01741	0	0.03383	0	0	0.02074	0.008354	0.0414	0
0.3029	0.1279	0.137	0.5896	0.004187	0.08507	0.002235	0.001594	0.01037	0.006562	0	0.01752
0.7703	0	0.08354	0.1642	0	0.06785	0	0.0167	0.006268	0	0.02419	0
7.7266	0	2.231	1.2252	0.06663	0.1988	0.03086	0.02248	0.00352	0.022	0.006676	0
0.5349	0	0.1018	0.06376	0	0.06021	0.009628	0	0.02244	0	0.04722	0
1.577	0	0.2645	0.3969	0	0.2161	0.02217	0	0.07801	0	0.1468	0
0.7351	0.07986	0.1212	0.187	0	0.07523	0	0.01584	0.01486	0	0.0946	0
0.8232	0	0.09972	0.352	0	0.1299	0	0.008274	0.000791	0	0.08948	0
1.1459	0	0.232	0.2691	0	0.1241	0	0.01453	0.0237	0.03589	0.07467	0
0.2711	0.1252	0.1252	0.4357	0.006015	0.1458	0.0113	0.2687	0.2617	0.3113	0.04266	0
0.765	0.444	0.4717	0	0	0.04651	0.02467	0.001373	0	0	0.1632	0

Table 9.2. The results of elemental analyses of the samples tested with XRF.

No	Find-spot	Cu	Sn	Pb	Zn	Ag	Fe	Au	Si
1	Chan'kiv	13.65	0	0	1.18	84.37	0	0.8	0
2	Chan'kiv	38.04	21.26	4.34	0.18	0.07	1.31	0	25.38
3	Chan'kiv	37.64	18.65	0.57	0.08	0	1.27	0	31.87
4	Chan'kiv	30.25	25.37	5.38	0	0.06	1.42	0	29.9
5	Chan'kiv	56.44	29.04	10.91	0.1	0.1	0.16	0	2.28
6	Vinnytsia region 2	43.81	36.25	13.16	0	0.09	1.08	0	4.23
7	Hanivka	35.27	41.09	15.16	0.03	0.13	0.78	0	5.53
8	Hanivka	16.84	35.62	39.37	0	8.06	0	0	0
9	Hanivka	57.3	33.21	5.98	0	0.21	0.09	0	0
10	Hanivka	56.05	39.96	1.3	0	0.12	0.63	0	0
11	Piln'nyi Mykariv	98	0	0	0	0.19	0.29	0	0.92
12	Piln'nyi Mykariv	64.25	29.26	5.02	0	0.17	0.1	0	0
13	Piln'nyi Mykariv	40.24	44.22	10.44	0.04	0.13	1.33	0	0
14	Piln'nyi Mykariv	43.35	35.8	3.03	0	0.29	0.73	0	11.15
15	Piln'nyi Mykariv	61.71	31.42	4.76	0	0	0.1	0	0
16	Piln'nyi Mykariv	57.26	27.27	9.86	2.8	0.07	0.23	0	0
17	Piln'nyi Mykariv	55.21	28.61	5.61	1.19	0.06	0.18	0	6.51
18	Piln'nyi Mykariv	42.37	39.25	7.79	3.51	0	0.27	0	5.35
19	Piln'nyi Mykariv	34.88	42.3	6.62	0	0	1.27	0	9.86
20	Piln'nyi Mykariv	44.58	28.62	16.65	0.23	0.03	0.38	0	6.73
21	Piln'nyi Mykariv	46.1	28.9	10.36	1.89	0	0.55	0	9.7
22	Piln'nyi Mykariv	28.01	37.64	6.49	0	0.05	1.27	0	19.92
23	Syvorogy	51.2	31.51	5.73	2.95	0.11	0.18	0	6.24
24	Syvorogy	60.2	31.06	2.09	2.86	0	0.17	0	0
25	Syvorogy	51.5	30.71	6.81	1.32	0.09	0.26	0	7.02
26	Syvorogy	60.22	27.21	3.76	0	0.05	0.14	0	5.43
27	Syvorogy	44.93	28.95	3.59	3.16	0	0.44	0	13.3
28	Syvorogy	53.01	22.93	2.51	3.81	0	0.32	0	13.09
29	Syvorogy	40.09	44.09	4.1	0.31	0.19	0.7	0	7.16
30	Syvorogy	38.79	43.62	6.81	0.31	0.19	0.37	0	7.31

Al	P	Ti	Cr	Mn	Co	Ni	Cd	Sb
0	0	0	0	0	0	0	0	0
7.75	0.93	0.09	0	0	0	0.1	0.05	0.49
9.01	0.32	0.22	0	0.03	0	0	0	0.34
7.2	0	0.33	0	0	0	0.07	0.02	0
0.97	0	0	0	0	0	0	0	0
0.89	0	0	0	0	0	0	0	0.5
1.89	0	0	0.06	0	0.05	0	0	0
0	0	0	0	0	0	0	0	0
0.83	0.52	0	0	0	0	0.04	0.05	1.77
1.95	0	0	0	0	0	0	0	0
0.15	0.02	0	0	0	0.05	0.37	0	0
1.16	0	0	0	0	0	0.03	0	0
3.22	0	0	0	0	0	0.03	0.04	0.31
4.51	1.11	0	0	0	0	0.04	0	0
0.93	0.6	0	0	0.06	0	0.1	0	0.32
0.99	0	0	0	0	0	0.1	0	1.43
2.52	0	0	0	0	0	0.08	0.05	0
1.34	0	0	0	0	0	0.12	0	0
2.9	1.88	0	0.05	0	0	0.09	0	0.16
2.69	0	0	0	0	0	0.03	0.06	0
2.36	0	0	0	0	0.03	0.05	0.06	0
6.13	0	0.13	0.05	0	0	0.18	0.03	0.1
1.89	0	0	0.05	0	0	0.08	0.06	0
2.6	0.88	0	0	0	0	0.09	0.05	0
2.2	0	0	0	0.03	0	0.06	0	0
2.03	0.92	0	0	0	0	0.02	0.03	0.19
4.45	1.08	0	0	0	0	0.11	0	0
4.23	0	0	0	0.03	0	0.08	0	0
2.44	0.88	0	0	0	0	0.05	0	0
2.52	0	0	0.05	0	0	0.04	0	0

KYRYLO MYZGIN

10. *Denarii flati*

ABSTRACT A general analysis is made of cast copies of denarii discovered on the territory of the Roman Empire and the European Barbaricum, with a proposed new Latin term — *denarii flati*. Despite significant differences in the status of the research within the Empire and beyond the limes, we identified some similarities and differences in the technology and chronology of production of *denarii flati*, the reasons for this production, and possible uses of these coins. While in the Roman Empire the phenomenon may date to as early as the second half of the second century, and was in full swing in the 230s–260s, in most areas of the Barbaricum *denarii flati* start at the earliest around the mid-third century–its second half, and peak in the late third century, possibly around AD 300. The production technologies used on two sides of the limes were also different: within the Empire the predominant method was casting in individual clay moulds, as opposed to the coin tree method used in barbarian territories. Nevertheless, the reason for this production was the same: to remedy the shortage of original coins. Both within the Roman Empire and the Barbaricum counterfeiters tried hard to make coins as close in appearance to the originals, adjusting the composition of the alloy and producing high-quality workmanship. Unlike in the Roman Empire some of the *denarii flati* were made of high-quality silver rather than base metal alloy, a production presumably initiated by the barbarian elites. Last of all, there is evidence that the necessary know-how may have spread to the Barbaricum from the territory of the Roman Empire.

KEYWORDS *denarii flati*, cast copies of Roman imperial denarii, Roman Empire, epidemic of counterfeiting, Barbaricum, coin moulds, base metal alloys, coin tree

Introduction[1]

One of the objectives of the project *Barbarian Fakers. Manufacturing and Use of Counterfeit Roman Imperial Denarii in East-Central Europe in Antiquity* has been investigation of cast copies of Roman denarii. While the study of cast denarii found on the territory of the Roman Empire goes back to the early nineteenth century, showing steady progress and unflagging interest, on the territory of the Barbaricum these coins are only starting to be less of a *terra incognita*. In this chapter an attempt is made to characterize the phenomenon of the forgery of Roman imperial denarii by casting pursued on different sides of the Roman limes, although the centre stage will be given to describing the evidence for this phenomenon from the territory of the Barbaricum, in line with the goal of the *Barbarian Fakers* project.

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Terminology

Back in the early 2000s Markus Peter (2004, 22) noted the lack of consensus in numismatic studies of the time either on the terminology or legal assessment of various groups of unofficial coins. This is exactly the case of cast copies of Roman denarii for which more than one term is currently in use. Of these the most traditional and most commonly used would be the descriptive 'cast copy of a *denarius*' or 'cast *denarius*' (e.g. Gitler and Ponting 2000; Peter 2001, 113–15; Abdy 2012, 504; Găzdac and others 2015; Nadvirnyak and Pohorilets 2019; Sidorovich and Ermalitskaia 2021), but there are other terms: false *denarii* (R.-Alföldi 1971; Boon 1988, 108; 1994), cast forgeries of Roman *denarii* (Raub, Zwicker 2012), denarii of unofficial production (Hall 2014), *moneta nigri* (Choref 2012, 158), base metal issues (Degler 2016, 15), imitations made of tin-lead bronzes (Romanowski 2017, 944; Dulęba and Romanowski 2018, 82, 99), cast imitations of denarii (Boiko-Haharin and others 2022).[2] However, at present one of the most commonly used terms when referring to cast copies of Roman coins, denarii included, especially by collectors and amateurs are 'limes denarius', 'limes counterfeit', and the most frequent of them all — *limesfalsa*.[3]

The term *limesfalsa* was used for the first time by Wilhelm Kubitschek (1921, 166) to describe cast copies of bronze coins found at Carnuntum, Austria. In doing so he also narrowed down its scope to copies of imperial bronzes (asses, dupondii, sestertii), and excluded provincial issues (Kubitschek 1921, 166). This understanding of the term was upheld by Eduard Lacom (1929), after which it became established in numismatic studies. As Matthias Pfisterer rightly noted (2007, 645), today the term *limesfalsa* has become blurred: in recent years nearly every Roman coin of irregular make (in this number, also *denarii subaerati*) has come to be described as *limesfalsa*.

There is no discussion that the word *limesfalsa* itself immediately suggests production in a workshop operated in a border region of the Empire, i.e. its *limes*. This is absolutely justified for the Danube series of forged lightweight bronzes definitely produced in outlying military settlements like Carnuntum (cf. Găzdac and Humer 2008, 45) and this is exactly what prompted Kubitschek to propose the term *limesfalsa*. However, as yet we have no data on a mass production of cast copies of denarii in the Roman limes. It seems that this term should and will be correctly used only in the sense of cast counterfeit lightweight aes, as it was originally intended (cf. Boon 1965, 161).

Setting aside the above discussion I propose to use a different new term to describe cast copies of Roman coins — *flati*. It is discussed at more length in this volume in a contribution by Bartosz Awianowicz, classical philologist associated with the Nicolaus Copernicus University in Toruń, Poland, who suggested the verb (participle, to be exact) *flatus*, meaning 'manufactured by casting'. In my view *nummi flati* is a good umbrella term to use for unofficial cast copies of Roman coin. Thus, cast copies of different denominations can be indicated using the formula: 'name of denomination' + the participle *flatus*: e.g. *dupondius flatus* (plural: *dupondii flati*), *sestertius flatus* (plural: *sestertii flati*), *denarius flatus* (plural: *denarii flati*), *antoninianus flatus* (plural: *antoniniani flati*), and so on. At the same time, it may be legitimate to use the term *limesfalsa* for lightweight cast aes copies, even if I consider standardizing the terminology a priority.

Past and Present Research

The first discovery of moulds for casting false Roman imperial coins was made in 1555 in Lyons, and published two decades later (Le Pois 1579; cf. Turcan 1982, 12). Since that time thousands of similar moulds, as well as cast coins, have come to light in different corners of the Roman Empire and the Barbaricum. I see no need to make a detailed review of pre-existing research in counterfeiting on the Roman territory — there is an excellent contribution penned by Matthias Pfisterer (2007, 648–54), and in addition, a fairly comprehensive bibliography in the work of Cathy King (1996). In recent years the subject of counterfeiting in the Roman Empire was developed significantly thanks to the works of Gérard Aubin (2003), Markus Peter (2004; 2011), Jérémie Chameroy and Pierre-Marie Guihard (Chameroy 2007; Guihard 2015; Chameroy and Guihard 2016), Fabien Pilon (2005; 2016), Cristian Găzdac, Ágnes Alföldy-Găzdac, Ovidiu Oargă, Razvan Gaspar (Găzdac and Alföldy-Găzdac 2001; Găzdac 2009; Găzdac and others 2015; Gaspar 2015; Găzdac and Oargă 2020), and others.

In general, past scholarship on counterfeiting within the Roman Empire has a few features in common: a) a long tradition (cf. Pfisterer 2007, 648–54); b) a focus both on accidental discoveries of objects and sites identified with counterfeiting, and on finds from recorded archaeological contexts (for a general discussion and list of reference literature see: Chameroy 2007, 539), including workshops (e.g. Schwartz and Wild 1950; R.-Alföldi 1971; 1974; Pilon 2016; Peter 2001, 239–51);

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[2] It is a serious mistake to use the term 'imitations' to denote cast copies, and certain to create confusion. On the difference between barbarian copies and barbarian imitations see: Dymowski 2021, 113.

[3] Sometimes an English translation of this term — frontier forgeries — is also used; see: Tilley 2021, 7.

c) output in the form of detailed records of the finds (Lallemand 1994; King 1996, 259–63 (short list); Aubin 2003, 150–56 (addition to Lallemand's catalogue); Pilon 2016, 103–46; Tilley 2021, 43–48); d) chemical composition analyses of the counterfeits (e.g. Gitler and Ponting 2000; Raub and Zwicker 2012, and the list of reference literature); e) active use of Roman laws on counterfeiting (Găzdac and Alföldy-Găzdac 2001; Gaspar 2015, 32–33; Chameroy and Guihard 2016, 237–38); f) experimental studies of the counterfeiting process and technological reconstruction (e.g. Andrieux and others 2005; Guihard 2015; Hall 2014). All of which helped improve our understanding of counterfeiting within the Roman Empire, propose scenarios for its development, and shed light on issues related to the production of *denarii flati* (Kunisz 1980; 1987; King 1996; Peter 2004; 2011).

By contrast, the study of counterfeiting activities and counterfeit coins on the territory of the Barbaricum is much less advanced, developed only in recent years. All the major catalogues of Roman coins, including finds from the territory of Eastern, Central, and Northern Europe (Bolin 1926; Kubiak 1979; Kunisz 1985; Kropotkin 1961; 2000; Braichevs'kyj 1959; Popa and Ciobanu 2003, etc.) only exceptionally contain information concerning the production of forged denarii — when they do, they refer to subaerate denarii, never to cast copies. This created a false impression that such coins are not typical for the territory of the Barbaricum. In fact, their absence from catalogues is due to the fact that most authors had used archival data, drawings, or photographs from which it is almost impossible to detect whether a coin was a cast piece or not. Indeed, even where these coins were available for inspection this does not mean that researchers were able to identify them as cast copies without specialized analysis. Other than that, with scholarship as it was at the time they would have found it hard to imagine the possibility of a mass occurrence of false coin in their study region. This would have led the researchers to identify, without a second thought, denarii of a highly irregular colour and/or texture as original Roman coins. It this situation we need to verify the early catalogues if only to get rectify our statistics of the distribution of official Roman denarii within the barbarian environment.

The problem of the distribution of cast copies in the Barbaricum attracted closer scrutiny from researchers only fairly recently. Interestingly enough, in Eastern Europe the first to take an interest in this group of coins were amateur metal detectorists and collectors. In 2011 the community of metal detectorists in Ukraine turned their attention to sites with the remains of manufacturing waste from the production of cast coins.[4] This topic sparked some interest and a lively discussion on the metal-detecting forum, various explanations were suggested (based more on an intuitive approach than on hard facts) concerning the emergence and growth of this phenomenon in the barbarian environment. This category of finds became sufficiently popular to be given a separate section for them on one of the largest auction sites in Eastern Europe.[5] The first to describe this phenomenon, based on the most recent materials from Ukraine and Moldova, was Oleh Anokhin, an amateur numismatist of Chernivtsi (Anokhin 2015, 10–15). A major contribution to the study was made by colleagues based in Khmelnytsky and Medzhybizh — Oleksandr Nadvirnyak and Oleh Pohorilets. Through their efforts the State Historical and Cultural Reserve (SHCR) 'Mezhybizh' added to its numismatic collection an assemblage of *denarii flati* and metal casting waste recovered in Ukraine, mostly in the Khmelnytsky and Vinnytsia regions. The same researchers analysed the chemical composition of these finds, and collected information about presumed workshops engaged in the manufacture of cast coins (Nadvirnyak and Pohorilets 2018; 2019; 2020; Pohorilets and Nadvirnyak 2021; 2022; and chapter 8 in this volume). Recently Ukrainian colleagues published complementary materials related to yet another possible centre of production (Boiko-Haharin and others 2022).

The *Barbarian Fakers* project contributed further to the progress of the research in *denarii flati*. Not only of their finds from Ukraine and Poland (Myzgin 2019, 37–38; Dymowski and Myzgin 2021a; Myzgin and Kodats'kyi 2021; Myzgin 2021, 458, 460), but also from Belarus (Sidorovich 2020; Ermalitskaia and Sidarovich 2021; Sidorovich and Ermalitskaia 2021). However, it must be said that the study of counterfeiting in the territory of the Barbaricum is still in its early stages, and the quality of our sources in most cases leaves much to be desired: the vast majority of this material are stray finds recovered casually or during metal detectoring and have no recognized archaeological context; the coins available for research are only a fraction of the material that is out there, picked up by members of the public. What we have at hand is sufficient only for general observations; so far, not a single coin counterfeiting workshop has been investigated, although materials from several of these sites have been presented.

Thus, there is no comparing the quality and quantity of the material, and the level of research on counterfeiting within the Roman Empire and within the Barbaricum.

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[4] <https://forum.violity.com/viewtopic.php?t=621817> [accessed 14 June 2022].

[5] <https://violity.com/auction/1537-limesnye-i-plakirovannye-monety-rima-oblomki-rimskih-monet> [accessed 14 June 2022].

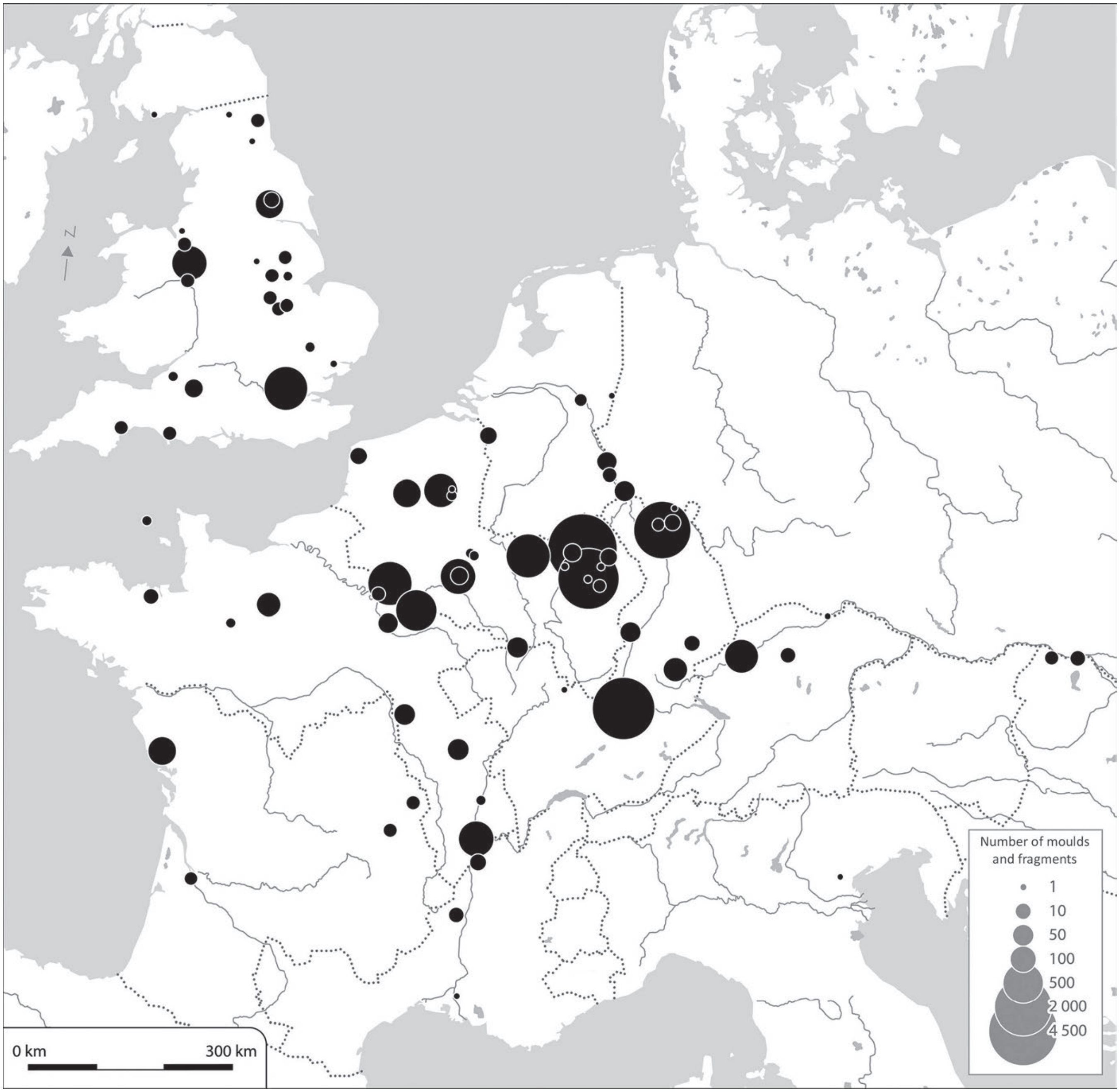
N
Number of moulds and fragments
1
10
50
100
500
2 000
4 500
0 km
300 km

Figure 10.1. Map of distribution of finds of clay moulds from the third century AD (after Chameroy and Guihard 2016, 239 fig. 2).

Despite this I will do my best to compare the phenomenon as recorded on either side of the Roman limes.

Production of *denarii flati* in the Roman Empire

Development of Counterfeiting and its Distribution

To describe the dynamics of the development of the phenomenon of counterfeiting across the Roman Empire some researchers have used the term 'counterfeiting epidemics' (Boon 1988, 113–18; King 1996, 239–41; Peter

2004, 22–26). These epidemics manifested themselves as waves of coin counterfeiting that arose at different times and different regions. As Markus Peter (2004, 26) noted, what epidemics of forgery have in common is the mass-scale of the production, but it is always limited in time and/or region of occurrence. In other words, if there was a serious outbreak of counterfeiting in some area at a certain point in time, then in other areas, at this time, there was no counterfeiting at all, or it was minimal (King 1996, 237). It should be emphasized that these epidemics primarily involved the production of cast coins. This is in contrast to, for instance, subaerate coins, circulated in any period and in every corner of the Roman Empire, since this kind of fake coin itself was a ubiquitous feature of all monetary economies (Peter 2004, 26).

King (1996, 243) identified nine counterfeiting epidemics, eight of them in the Imperial period: one in the first century, two in the third century, four in the fourth, and one in the late fourth–early fifth centuries. By contrast, Peter (2004, 23–26) recognized the following epidemics of the Imperial period: in the first half of the first century, the time of the mass circulation of bronze coins in the north-western provinces of the Empire; in the first half–mid-third century, time of the mass-scale counterfeiting of small bronzes in the Danube region, and in Britain and Gaul — of denarii; in the last quarter of the third century, time of the mass-scale counterfeiting of antoniniani in the north-western provinces; next, following the monetary reforms of Diocletian, and in the first quarter of the fourth century, in Egypt the onset of a mass-scale production of bronzes; finally, between the late fourth and the sixth centuries — an epidemic of counterfeiting bronze coin in the eastern Mediterranean, mostly Egypt.

What interests us in this study is the production of cast copies of denarii, or *denarii flati*. As noted earlier, within the Roman Empire this production was concentrated in the north-western provinces: finds, both of casting moulds and individual *denarii flati* have been recorded *en masse* in north-eastern France, south-western Germany, north-west Switzerland, and England[6] (Fig. 10.1; cf. King 1996, 260, map 1; Peter 2001, 239). Outside these regions assemblages of *denarii flati* are known from two locations: a hoard of 232 of these coins was found on the territory of Dacia, at the Roman fort in Apulum (near Alba-Iulia, Alba county/Romania) (Găzdac and others 2015), and an assemblage containing *denarii flati* and production waste, now in the Israel Museum, Jerusalem, probably recovered somewhere in the Levant (Gitler and Ponting 2006). Nevertheless, my discussion of the production of *denarii flati* in the Roman Empire is based on materials from the north-western provinces.

Organization of Manufacture

Despite the large number of finds of casting moulds,[7] the number of known sites where they could have been produced or used is very small. Absolutely the most important find are the workshops found at Pachten (Saarland/Germany), where the site of a smithy yielded 2539 moulds with impressions taken from 141 coins, of which 113 were denarii (R.-Alföldi 1974, 426–28). At Damery (Marne/France), among the ruins of a building destroyed by fire, under a layer of ashes and broken roof tiles, more than three hundred coin moulds were discovered, some of them for casting denarii; there were also tools and metalworking refuse, evidence for casting of the coins on the site (Lallemand 1994, 168). In Bordeaux (Gironde/France) four moulds for casting denarii were found on the site of a pottery workshop (Lallemand 1994, 167). Another workshops, where cast denarii were also made was recognized at Châteaubleau (Seine-et-Marne/France) (see at greater length the contribution by Fabien Pilon in this volume). Traces of the production of cast denarii were likely discovered in Augusta Raurica, where denarii flati account for no less than 9% of the coin finds dated to the first – third centuries (Peter 2001, 239, 243–44). However, an absolutely staggering number of moulds for casting coins, *denarii flati* included, have been discovered outside such production centres. Their context of discovery varies greatly, but most often they were recovered from waste layers: waste pits, sewers, water wells, empty cisterns, crypt debris, scattered among other garbage, in the remains of a cellar, in the ruins of an older bathhouse, sometimes even in burials (at greater length see: Chameroy 2007, 539). An extraordinary find was made in Arras (Pas-de-Calais/France), where hundreds of coin moulds had been packed in a wooden case with iron tongs, a crucible, a sword, and mail, and thrown into a well (Jacques and others 1993, 553). One way or another, what all these finds — whether of workshop remains, or individual moulds — have in common is that almost all of them came to light in urban contexts, and only exceptionally in rural settlements.[8] Thus, counterfeiting was essentially

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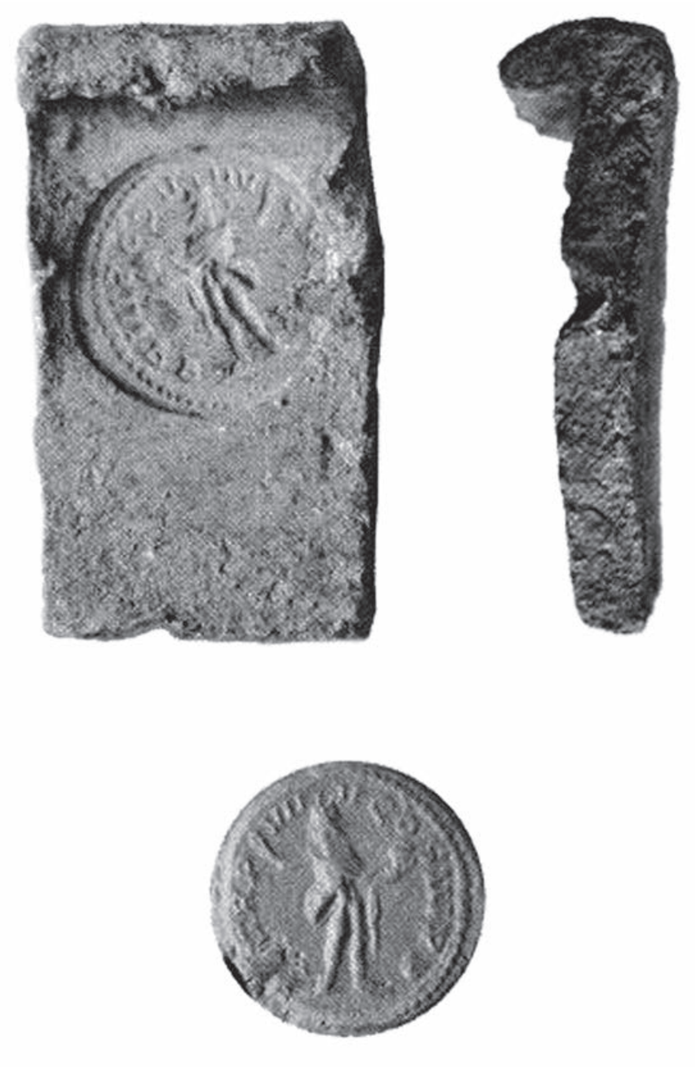
[6] On the other hand, it may also be related to the state of research.

[7] The ratio of casting moulds to cast coins is unknown to me but I have the impression that the former outnumber the latter.

[8] Nicholas Holmes and Fraser Hunter (2001, 171) suggest that in Britain the forgers 'were probably itinerary craftsmen, who for obvious reasons preferred to ply their trade in out-of-the-way places and move on frequently in order to avoid detection', noting also that 'counterfeiting materials have been found in caves which probably served as hideaways'.



Not to scale, approximately 2:1

Figure 10.2. Lead mould from Oedenburg-Biesheim, Haut-Rhin department, France, for copying the Severus Alexander denarius of RIC IV.2 102 type (AD 230, Rome). Size: 44 × 23 × 5 mm (after Biellmann 2013, fig. 1).

an urban activity (Guihard 2015, 276 table 3; cf. Reuter 2002, 127). As Guihard (2015, 273–74) very correctly noted, one gets a general impression that the production of cast counterfeits was associated with metalworking, for instance, bronzecasting, more than with any other craft. Although obviously the manufacture of cast coins would have called for the involvement of individuals with different but complementary skills at the intersection of metallurgy and pottery (Chameroy and Guihard 2016, 244).

Technique of Manufacture

One of the most common processes in the production of counterfeit coin was casting in clay moulds. Although, e.g., in the workshops at Châteaubleau traces were found of the use of four methods of manufacture: casting in clay moulds and striking — cast coin blanks, coin blanks cut from sheet metal, or coin blanks cut from a rod; denarii were forged using the first and the fourth of these methods (Pilon 2005, 794). A rather rare method involved casting in metal moulds (e.g. a lead mould from Oedenburg-Biesheim (Haut-Rhin/France): Biellmann 2013; Fig. 10.2) or five lead moulds from Augusta Raurica (Peter 2001, 243).

The technology of casting in clay moulds has been described in some detail and studied experimentally (Andrieux and others, 2005; Pfisterer 2007, 658–64; Guihard 2015, 267–72; Hall 2014, 172–77; Hall and Goodburn Brown 2015, etc.), therefore, I see no point in dwelling on this subject in detail again. In short, the method involved impressing the obverse and reverse of an original Roman coin (or coins) in clay, leaving a slot for pouring the molten metal, baking the clay disc with the imprint, assembling the moulds with the impressions of the obverse and the reverse, filling them with molten metal, and finally filing away the casting sprues. The simplest and most efficient way was to make a separate mould for each coin with a separate sprue, several of which would then be stacked up into a 'column' (Fig. 10.3). Usually these moulds, especially for the production of *denarii flati*, were made with great care: thin, with a carefully made impression, and a neatly smoothed edge. A much less frequently used technology for casting denarii was the so-called 'coin tree' method where impressions were made side-by-side on a larger bat of clay, the two bats with the impression of opposite sides of a coin were assembled, filled with metal; the final step was the removal of casting sprues (Pfisterer 2007, 659; Găzdac and Humer 2008, 43; Găzdac and others 2015, 12).

Chronology of Manufacture

Back in the day, George Boon (1994, 113) aptly noted that it is always easier to pinpoint the end of a counterfeiting epidemic than its beginning. As a rule, in determining the time of production of false coins researchers use the date of their prototypes (cf. Aubin 2003, 141–44). In Jérémie Chameroy's (2007, 542–43) table with an overview of the chronological distribution of denarii moulds made by emperor and denomination, the largest number had impressions taken from the denarii of Septimius Severus and his successors, with the latest prototypes dating to Severus Alexander and Maximinus Thrax. At the same time, most of the mould assemblages have impressions of denarii, antoniniani, and occasionally of smaller denominations. Only some moulds assemblages have an earlier dating, and were used only to make denarii: e.g. the moulds

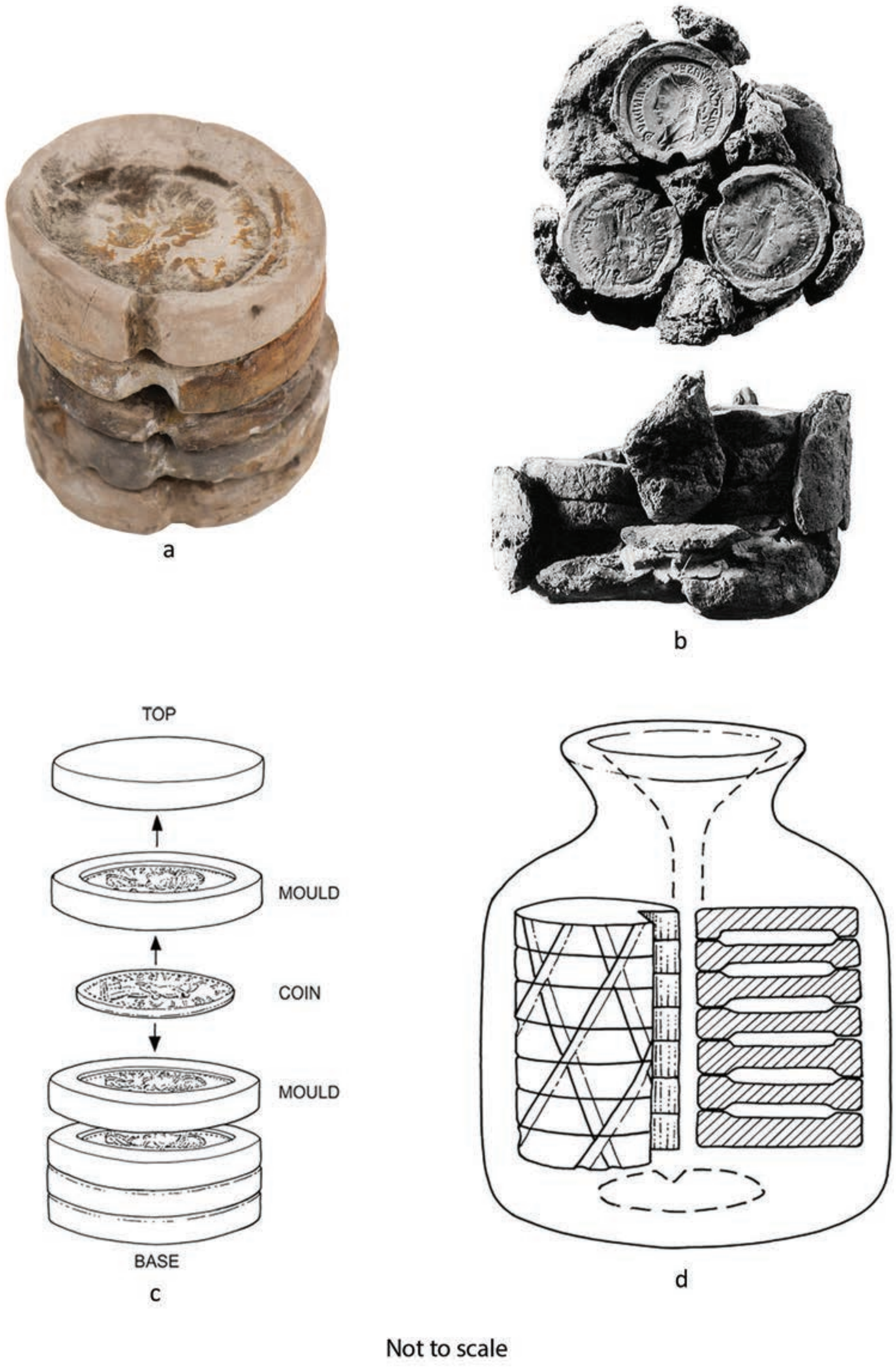


Figure 10.3. Technology for the production of *denarii flati* using clay moulds: a – stack of Roman coin moulds from Lingwell Gate (© York Museums and Gallery, YORYM: H2402); b – clay coin moulds from Pachten (after R.-Alföldi 1974, pl. 53); c – reconstruction of the column of Roman coin moulds (after Hall 2014, 173 fig. 4); d – reconstruction of a container with three coin mould columns (after Hall 2014, 175 fig. 5).

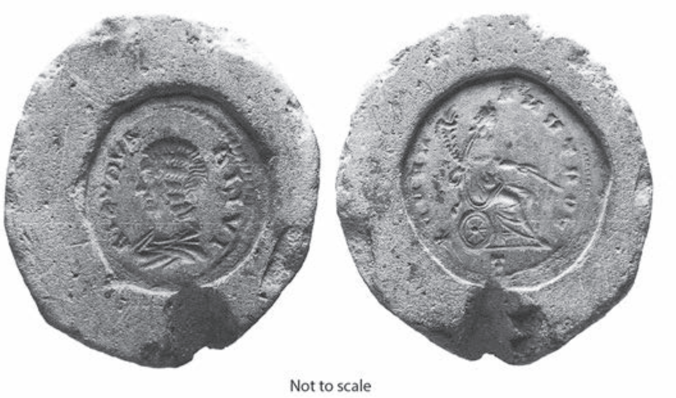


Figure 10.4. Clay mould from Corseul, Côtes-d'Armor department, France. Obverse: impression from denarius of Septimius Severus (for Julia Domna), RIC IV.1 166 (AD 196–211, Rome); reverse: impression from antoninianus of Aurelian, RIC V.1 128 (AD 271–273, Milan) (after Aubin 1990, 258–59).

from Rottweil (Baden-Württemberg/Germany) have impressions taken from denarii of Trajan and Hadrian (Nuber 1988), those from Rottenburg am Neckar (Baden-Württemberg/Germany), have impressions of denarii of Domitian, Trajan, and Hadrian (Reim 1994, 137–38). A hoard of *denarii flati* from Apulum consisted in the main of coins with prototypes from the Severan period, closing with an issue from the reign of Elagabalus (Găzdac and others 2015, 9).

Very likely, the first wave of the production of *denarii flati* occurred already in the second half of the second century on the territory of present-day Germany (Rottweil and Rottenburg), and in north-west Switzerland (Augusta Raurica), but the main phase began no earlier than in the 230s, and continued into the second half of the third century. At this time both *denarii flatii* and *antoniniani flati* were produced, and on occasion, even *limesfalsae* (Chameroy 2007, 541, 544). Very likely, the majority of *denarii flati*, copies of coins of Septimius Severus and his successors, as far as Gordian III, were made in the north-western provinces between the 240s and 260s (Chameroy 2007, 545), while in Dacia — not earlier than the 230s (Găzdac and others 2015, 10). The latest reliable evidence for the production of *denarii flati* dates from the 270s:[9] a mould impressed with an obverse of a denarius with a portrait of Julia Domna on one side and a reverse of an antoninianus of Aurelian on the other found at Corseul (Côtes-d'Armor/France) (Fig. 10.4; Aubin 1990, 259). In any case it seems that the forgers used denarii of the second century still in circulation in the north-western provinces, as well as issues of Severus and his successors, up to the coins of Gordian III. Since the 260s the most commonly used coins are antoniniani, which by this time had practically displaced the denarii (cf. Chameroy 2007, 544–45).

Alloy Composition Studies

Analysis of the chemical composition of *denarii flati* and waste from their production shows that most were cast of an alloy of copper, tin, zinc, and lead, in various proportions, but almost always with a predominance of copper (cf. Chameroy 2007, 540; Hall 2014, 177). Coins made of such an alloy would have a silvery hue without the need to add any silver (Chameroy 2007, 540, in more detail also see below). Among coins of this description Cristoph Raub and Ulrich Zwicker distinguished two main groups: coins of an alloy based on copper and tin, and coins made of alloys based on copper, tin, lead, and zinc (Raub and Zwicker 2012, 220).[10] Much rarer were alloys containing silver, copper, and tin (Raub and Zwicker 2012, 219), e.g. from Rottweil (62 per cent silver, 30 per cent tin, 8 per cent copper) (Nuber 1988, 352–53) and from the eastern Mediterranean (up to 55.3 per cent silver) (Gitler and Ponting 2000, 532). Generally speaking, the composition of the metal of *denarii flati* from the territory of the Empire requires further research even if some valuable observations have been made (see below; see also: Chameroy 2007, 541; Chameroy and Guihard 2016, 238).

Reasons for the Production and Uses

Researchers are generally in complete agreement as to the reasons for the outbreaks of counterfeiting epidemics within the Empire: inflationary phenomena, mint closure, change to the denominational system, change in alloy content, social and political upheaval (Orlandoni 1985, 62–63; King 1996, 242, 243; Peter 2001, 244–45; 2004, 26). They almost always resulted in coin shortages and, as a result, the need to take appropriate measures aimed at eliminating this (Peter 2001, 245; 2004, 26). As for the production of *denarii flati* in north-western provinces of the Empire, here the reason was evidently the shortage of silver coin which affected the northern edge of the Roman Empire after 238 (cf. Chameroy and Guihard 2016, 239). It is likely that similar processes could have caused episodic production of *denarii flati* on the Danube (cf. Găzdac and others 2015, 14).

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[9] George Boon (1988, 124–26) proposed 282–283 as the time when it was no longer necessary to manufacture cast coins in the provinces. I have to agree with Jérémie Chameroy (2007, 544–45) that the chronology and dynamics of the development of counterfeiting probably reflect regional differences.

[10] Though coins of pure tin have been recorded (Gitler and Ponting 2003, 34).

Another issue no less central to our research is the character of this production: Was this a legal compulsory measure meant to sustain the economy in the absence of currency, or a private initiative of counterfeiters who took advantage of the market demand (cf. Aubin 2003, 141–44)?

To all intents and purposes the author of the first hypothesis was Maria R.-Alföldi. Examining the evidence for the counterfeiting of denarii and antoniniani in the north-western provinces of the Roman Empire she made the following points: 1) the Roman counterfeiting laws — *Lex Cornelia de falsis* (*c.* 81 BC) refer to acts of counterfeiting of silver and gold coins only, the monopoly on the minting of bronze coins was introduced by Constantine I only in 326 and was upheld by Constantius II in 343; thus, the production of bronze coins was not prosecuted by law; 2) the lower weight of counterfeits compared to their prototypes and their metal suggest that the cast coins were circulated legally, and covered local domestic needs during a shortage of fine bronze coins; 3) the appearance of counterfeit coins (their poor workmanship) makes it unlikely they could have deceived anybody;[11] 4) the cast counterfeits were made by the masters to order, and openly (workshops and moulds have been found mostly on the site of provincial towns) (R.-Alföldi 1971, 360–62; 1974, 433–34). The arguments of R.-Alföldi came to be accepted by several researchers (cf. Callu 1969, 259–60; Schwartz 1975, 208; Turcan 1982, 21; Gricourt 1993, 559–60; Morelli 1990, 128–29; Peter 2004, 26). According to Markus Peter the production of these coins was not counterfeiting *sensu stricto*, but a necessary regional-scale economic measure, even if partly falling into a grey zone (Peter 2001, 245; 2004, 26). Andrzej Kunisz described these issues as *monnaie de nécessité*, and considered them coin issues produced without official permission, but designed to fill a short-term shortage of coins in circulation, aimed at regulating commercial operations (Kunisz 1987, 257–65). Or, in other words, on the money market they served as a supplementary resource, a substitute for silver and bronze coin, even if from an unofficial source, for the smooth conduct of trade and maintaining the financial stability of a particular region (Kunisz 1980, 137).

However, a number of researchers have criticized this proposition (Hasler 1980; Lallemand 1994, 146–47; King 1996, 245; Chameroy 2007, 541; Guihard 2015, 276–77). Gérard Aubin noted the lack of a coherent description of the counterfeiting phenomenon in the north-western provinces: Did the initiative to produce counterfeit coins come from military authorities, or only from individuals, to 'alleviate' their own cash shortage or shortage of coins on the market? And why, in copying denarii and antoniniani create a new species of bronze coins? (Aubin 2003, 141–42). Researchers propose considering coin counterfeiting an exclusively private initiative, entirely divorced from any desire to support the local financial market, the coins were produced with the intention to deceive, and for the financial benefit of the forger. As Boon (1988, 117, 118) noted, however widely scattered and multitudinous, the copies were in fact false. According to King (1996, 242, 244), the primary motivation underlying the production of false coin in most cases was greed and consequently this coin was produced with the intention to deceive. The mode of production was immaterial, the quality of the false coin was more relevant. In the view of Jérémie Chameroy and Pierre-Marie Guihard in understanding the production of *denarii flati* and *antoniniani flati* a key role is played by chemical composition analyses of their alloy. These identified its ingredients as copper, with a high proportion of tin or lead, which gave the freshly cast coins a silvery rather than bronze appearance. Thus did the forgers break the counterfeiting laws (i.e. *Lex Cornelia de falsis*): with their silvery appearance cast coins could be mistaken for official minted coins: considered counterfeit by the legislator, their circulation was prohibited (Chameroy 2007, 541; Chameroy and Guihard 2016, 238). Apparently, the manufacture of cast copies was an urban activity because the forgers wished to be close to the consumer (Guihard 2015, 276). At the same time, the context of the finds themselves does not give a clear answer: Were these coins manufactured 'in the open' (tolerated by the authorities which treated this production as that of emergency money) or was it a clandestine operation carried out in the back rooms of workshops because it was punishable as coin counterfeiting (Chameroy 2007, 539). Another interesting observation is that in fact counterfeit coins account for not that high a percentage among finds: e.g. in north-eastern Gaul, out of one hundred denarii only ten were fake, indicating the minor role played by forgeries in coin circulation, too small to rectify the shortage in the coin supply. This suggests that these coins may have been intended only to fulfil specific needs or wishes (Guihard 2015, 277; Chameroy and Guihard 2016, tables 11, 12). As Chameroy and Guihard (2016, 259) noted, the actual reason for taking up coining activity could have been the distrust of the newly introduced antoninianus and preference for a better coin, attachment to the long-established denominations, and the high local rate of the denarius.[12] Simultaneously, an increased demand for denarii coincided with the discontinuation of their regular manufacture. The counterfeiters would have reacted to this growing demand, manufacturing copies of denarii until the antoninianus had established itself on the money market in the north-western provinces (Chameroy and Guihard 2016).[13]

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[11] This is something pointed out back in the day by Wilhelm Kubitschek (1921, 153, 163) in his discussion of *limesfalsa*.

Production of *denarii flati* in the Barbaricum

As noted earlier, research on counterfeiting in the Barbaricum is significantly less advanced than studies of this phenomenon within the Empire. Consequently, the evidence now available is sufficient only to describe the phenomenon only in fairly general terms.

Distribution

The relatively poor understanding of the phenomenon does not yet allow us to determine its range with the same precision as for the different counterfeiting epidemics within the Empire. If only because the nature of the phenomenon itself is not yet fully understood, as I will elaborate below. At the current level of knowledge we can identify only some isolated foci, and indicate only broadly the distribution range of cast counterfeit denarii.

Clearly, the hotbeds of forgery are where we have recorded sites of Roman coin copying. On the territory of Ukraine we found at least five such hubs. While unfortunately not one of them has been investigated archaeologically so far, these locations have yielded a large number of finished, unfinished, or failed *denarii flati* and debris from their production. On this evidence it is reasonably safe to identify these sites as centres of production of counterfeits. They were discovered in Ukraine in the 2010s by metal detectorists in the area between the upper reaches of the Southern Bug and middle reaches of the Dniester, in the Khmelnytsky region: at Korzhivtsi, Zagintsi, Klishchiv, Kormylche, and Abrykosivka (Pohorilets and Nadvirnyak 2022, also, the text and map contributed by these researchers to the present volume). Further individual presumed counterfeiting workshops are known from other regions of western Ukraine (Boiko-Haharin and others 2022, 41). I believe that on the territory of western, and possibly, central Ukraine we can expect to see many more finds of such workshops in the future.

However, even at this early stage we can say that the pool of *denarii flati* from the territory occupied by the people of the archaeological Chernyakhiv culture is already fairly impressive: at present it definitely comprises several thousand finished *denarii flati*. Unfortunately, most of them come from amateur metal detectoring and have no recorded archaeological context. Out of 27,751 coin finds published on the metal-detectoring internet forum Violity between 1 September 2013 and 1 September 2015,[14] at least 1491 were identified as *denarii flati*, that is, 5.3 per cent. For comparison, denarii identified based on their appearance as official issues accounted for 19,845 coins, or 75.5 per cent of the pool. Better yet, between 1 April 2021 and 1 June 2022, the number of *denarii flati* published on the same internet forum was 505 finds.[15] To this we must add a group of several dozen *denarii flati* now in Medzhybizh (see the text of Oleksandr Nadvirnyak and Oleh Pohorilets in this volume).

When it comes to centres of production of *denarii flati* in other regions of the Barbaricum the evidence at hand is limited. It is possible that one of them was in northern Germany. At least, this is evidenced by materials discovered recently at Raguth (Mecklenburg-Vorpommern/Germany), where the remains of the production of *denarii flati* in high-grade silver were found (Wigg-Wolf 2023).[16] Four *denarii flati* and a fragment of a silver plate were found in a small area. Chemical analysis of the coins showed that three of them were made of high-quality silver (Wigg-Wolf 2023, Abb. 1–5). Archaeological investigations are planned for this site, which is most probably where *denarii flati* were produced, in the near future.

With some caution we may identify as centres of production sites where individual coiners' moulds have been discovered. One such mould, made of bronze was found in Ukraine at Symoniv, in the Rivne region

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[12] Arkadiusz Dymowski also drew my attention to another possibility. Namely, in the third century, denarii from the first–second centuries became less and less circulating money and increasingly the object of hoarding. It has not been ruled out that the massive scale of counterfeiting in the third century in the Empire was also because circulating money was not counterfeited. Thus, counterfeiters felt more secure, as the state did not pursue them as much, than if they had counterfeited current money. I thank my colleague for his valuable comment.

[13] Another problem addressed in the research is the potential ritual role of cast copies of Roman denarii. Kubitschek (1921, 163) speculated whether *limesfalsa* could not have been manufactured expressly for the burial rite, while Holmes and Hunter (2001, 173) discussed votive denarii possibly created as material for ritual deposition.

[14] Data assembled in 2016–2017 by Mikhail Ovcharenko, Dmitriy Filatov, Maryna Filatova, and Kyrylo Myzgin.

[15] Data assembled by Maryna Filatova. Since this data included selected categories of finds the percentage made up in this group by *denarii flati* is unclear. I am grateful to this researcher for letting me use this material.

[16] See also: <http://afe.dainst.org/findspot?afeid=3687> [accessed 10 December 2023].

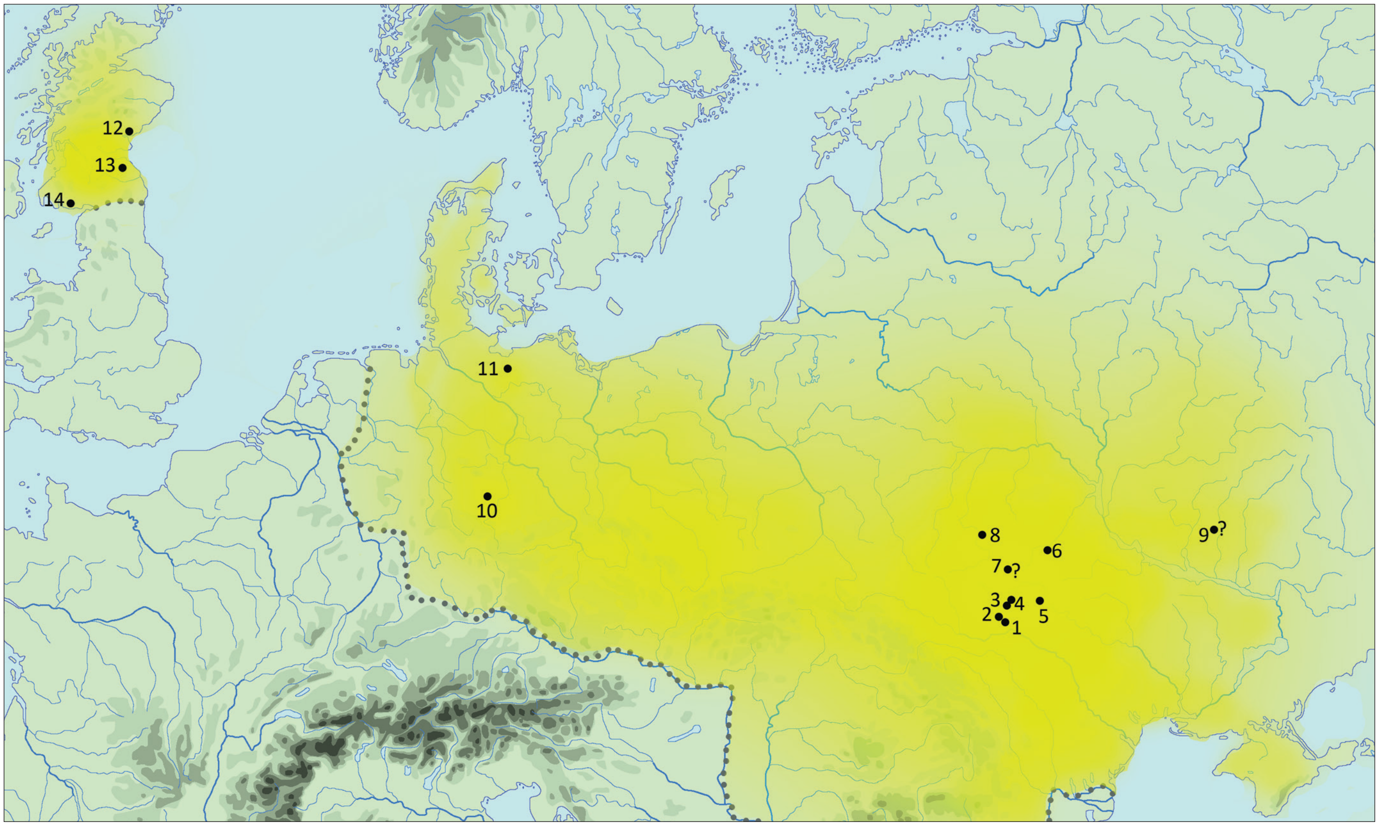

Figure 10.5. Distribution of finds of *denarii flati* and production centres (confirmed and putative); the intensity of the color corresponds to the intensity of the finds: 1 — Abrykosivka, Khmelnytsky region, Ukraine; 2 — Kormylche, Khmelnytsky region, Ukraine; 3 — Zagintsi, Khmelnytsky region, Ukraine; 4 — Korzhivtsi, Khmelnytsky region, Ukraine; 5 — Klishchiv, Khmelnytsky region, Ukraine; 6 — Ozadivka, Zhytomyr region, Ukraine; 7 — Krasyliv (environs), Khmelnytsky region, Ukraine; 8 — Symoniv, Rivne region, Ukraine; 9 — Poltava region, Ukraine; 10 — Frienstedt, Thuringia, Germany; 11 — Raguth, Mecklenburg-Vorpommern, Germany; 12 — Beechwood, Dundee, Scotland; 13 — Newstead, Roxburghshire, Scotland; 14 — Brighouse Bay, Kirkcudbrightshire, Scotland (drawing: Kyrylo Myzgin).

(Myzgin 2019, 37). Three clay moulds for casting early third-century denarii were discovered in Scotland: in Brighouse Bay, Kirkcudbrightshire; Beechwood, Dundee; and Newstead, Roxburghshire (Holmes and Hunter 2001, 168–69).

It is less clear whether it is legitimate to interpret as potential centres of production sites known to have yielded coins and obvious casting debris or unfinished specimens: e.g. the site of discovery at Pozhezhin (Brest region/Belarus) of a *denarius flatus* with a casting sprue (Sidorovich 2020, 73 fig. 1: 1), or the site at Ozadivka (Zhytomyr region/Ukraine) (Pohorilets and Nadvirnyak 2022, 16 fig. 6). Another site with only a broad location in the Poltava region in Ukraine produced a slab identified with some confidence with the casting of denarius copies (Pohorilets and Nadvirnyak 2022, 16 fig. 5). On the one hand, it hardly makes sense for these objects to have been taken far from the production centres. On the other hand, these are random single finds, lacking context and without information about other traces of coining at the find-spot. Therefore, this question must remain open.

The number of known finds of *denarii flati* is too small at present, and the research insufficiently advanced to define the boundaries of their circulation range within the Barbaricum (Fig. 10.5). The large-scale circulation of these coins on the territory of the Chernyakhiv culture is confirmed both by the presence of the aforementioned coining workshops and hundreds of single-finds of *denarii flati*. While the largest concentration of these finds is noted in the western and central regions of Ukraine (cf. Filatova 2023), they are also well known from the periphery of the Chernyakhiv territory: in the east (Myzgin and Kodats'kyi 2021, 53–54), north-west (Myzgin 2019, 37), and south (Choref 2012, 174 fig. 2: 6, 7; Myzgin 2024, 67). According to the information from Lilia Dergaciova[17] the territory of the Republic of

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[17] I am grateful to this researcher for letting me use this unpublished data.

Moldova has produced finds of finished and unfinished *denarii flati* but so far, no debris associated with their production. *Denarii flati* have been recorded in Romania (Munteanu and Vornicu 2022), e.g. in grave inventories of the Poienești-Vârteșcoiu culture (Munteanu and others 2022, 69).

It seems that so far the most easterly find of a *denarius flatus* from our part of the Barbaricum is a cast copy of a denarius of Antoninus Pius (for Diva Faustina I) recovered on the Moshchino culture hillfort at Supruty, Tula region, Russia (Myzgin and Kodats'kyi 2021, 55). The northern range of *denarii flati* in eastern Barbaricum is marked out by finds from Belarus, where they tend to cluster in contexts of the archaeological Wielbark culture, in the basin of the Western Bug, but are noted also in the basin of the Neman (Sidorovich 2020, 70–71). In Poland the largest number of finds of *denarii flati* was recorded on the territory of the Przeworsk culture (Romanowski 2017, 944; Dulęba and Romanowski 2018, 81–83; Balbuza 2021, 20; also the contribution by Jarosław Bodzek, Szymon Jellonek, and Barbara Zając in this volume). Sites of the Wielbark culture in Poland have produced only a handful of single finds (cf. Myzgin 2021, 458, 460), but this, to judge by the number of *denarii flati* recorded on Wielbark culture sites in Belarus (Sidorovich 2020, 70) and Ukraine (Kozak 2012, 145; Myzgin 2019, 37), must reflect the state of research rather than the reality. This is probably true also of the situation in other parts of the Central European part of the Barbaricum, in 'non-Roman' areas of Czechia, Hungary, Austria, where to my knowledge no finds of *denarii flati* have been recorded, but there is a good chance that in fact they await discovery, either in the field or in assemblages of early coins where they remain unrecognized.

In the 'barbarian' area of present-day Germany the phenomenon of *denarii flati* does not seem equally widespread, even though it is here, at Raguth (Mecklenburg-Vorpommern/Germany) that we find evidence of their large-scale production (Wigg-Wolf 2023). An interesting group of these coins was found at Frienstedt in Thuringia, discussed in this volume by Mario Schlapke. The number of *denarii flati* recovered from the settlement suggests their production on this site (see the text by Mario Schlapke in this volume), although they could have arrived here from the Roman Empire.

In Scandinavia, on the other hand, cast copies of denarii have never been treated as a separate group, although in my view they are there to be found in Denmark. I suspect that denarii with a 'high copper content' from Ryomgård Skov, eastern Jutland (Horsnæs 2010, 55 fig. 21) are in fact, *denarii flati*. Another possible *denarius flatus* was found at Neble on Zealand (Horsnæs 2010, 46 fig. 16), a few, at Øster Vandet in north-western Jutland (Horsnæs 2010, 52 fig. 20), and on the island of Bornholm (cf. Horsnæs 2013, 54 fig. 24). In Sweden, on the island of Gotland in particular, while original Roman denarii are quite common, no finds of their cast copies have been recorded so far (cf. Lind 1988). By contrast, in the eastern Baltic region (Lithuania, Latvia, Estonia, Kaliningrad Oblast) finds of denarii are rare, thus finds of *denarii flati* are little expected. A possible cast copy is a coin with a portrait of Hadrian found on the surface of the cemetery Putilovo 2 (fmr Gauten) in Kaliningrad Oblast, but this needs confirmation by chemical analysis (Skvorcov 2022, 219 fig. 184: 5). Last but not least, single finds of *denarii flati* have been recorded in Scotland (Holmes and Hunter 2001; Holmes 2006, 23–24).

In summary it may be said that finds of *denarii flati* are known from almost every corner of the European Barbaricum but today the largest number by far (both single finds and traces of production), are recorded on the territory of the Chernyakhiv culture. But this may only be a reflection of recent scholarship.

Organization of Manufacture

As noted earlier, so far no workshops for casting *denarii flati* identified on the territory of the Barbaricum have been investigated archaeologically or if they have been, they await publication. Consequently we have no data to make a closer study of how this production was organized. At least three possible workshops have been identified in Eastern Europe, in Ukraine: at Korzhivtsi, Abrykosivka, and Kormylche, all three in the Khmelnytsky region — in settlement contexts of the Chernyakhiv culture (Pohorilets and Nadvirnyak 2021, 177). Without further research it is hard to say at present whether the production on these sites was limited to counterfeit coinage only, or also included the working of non-ferrous metals. Logic would suggest the latter. Finds of remains of non-ferrous metalworking premises (unfinished objects, production debris, tools, crucibles) are not infrequent among settlement finds identified with the Chernyakhiv culture (cf. Magomedov 2001, 95–96), and quite possibly some of these workshops could have manufactured privately commissioned cast copies. This is something Pierre-Marie Guihard thought possible within the Roman Empire (see above). Also possible is counterfeiting production carried on by 'itinerant craftworkers' who worked to order using local raw materials and production capabilities.[18] In any case, finds of remains from the production of cast

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[18] Holmes and Hunter (2001, 171) examined this possibility for Scotland. Mark Shchukin (2005, 180) argued the involvement of itinerant craftworkers in glassmaking in the Chernyakhiv culture.

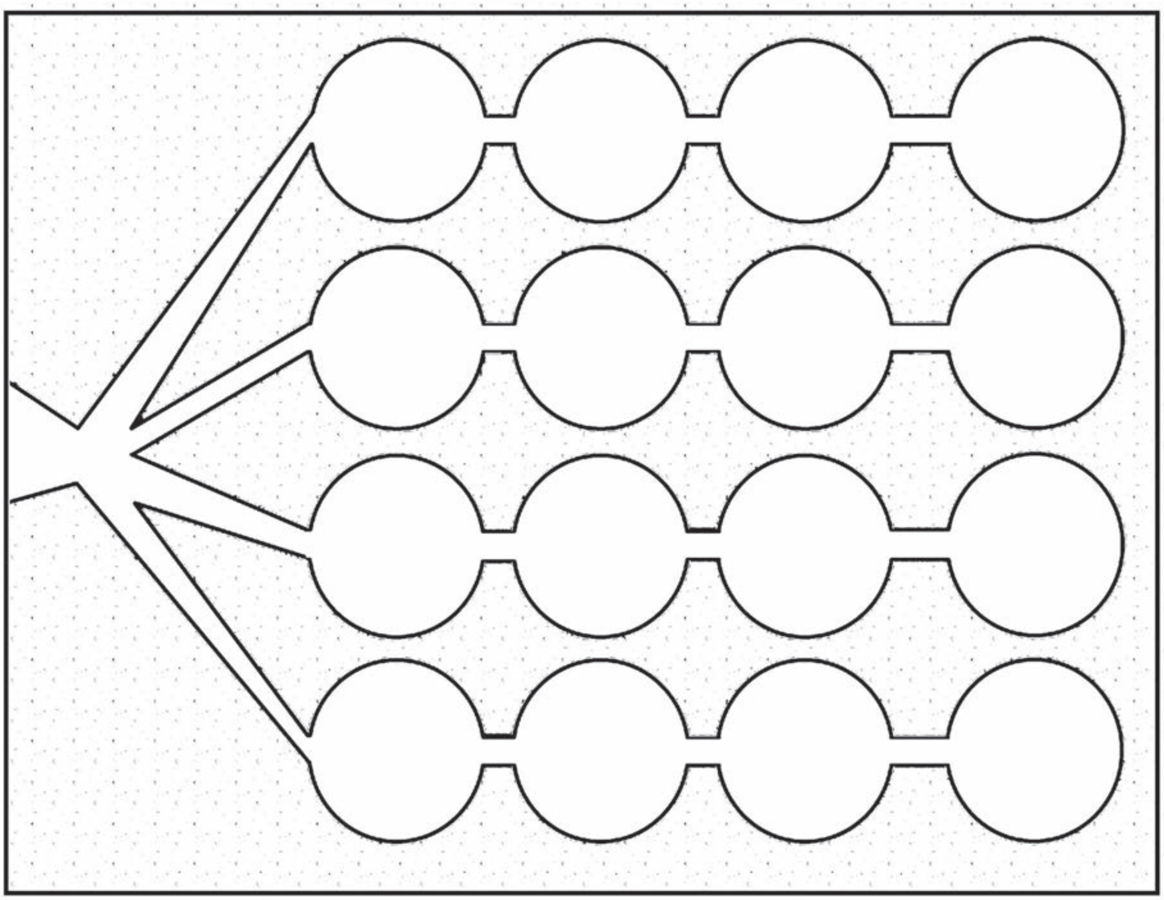

Figure 10.6. The 'coin tree' casting method (after Găzdac and others 2015, 31 fig. 1:d).

copies of Roman coins on the surface of settlements suggest that the manufacture of *denarii flati* was not clandestine in contrast to their counterparts within the Empire, where it was prosecuted. This problem is discussed in more detail later on.

Technique of Manufacture

Given that the problem of the manufacture of cast copies within the eastern Barbaricum, *denarii flati* included, is addressed by Oleksandr Nadvirnyak and Oleh Pohorilets in their contribution to this volume, below I limit myself to presenting some additional comments and my ideas on the distinctive features of this production.

As Nadvirnyak and Pohorilets point out, among materials interpreted as debris from the production of cast denarii there is a preponderance of coins made using the 'coin tree' method. Popular in antiquity, this technology has been researched and discussed quite well (Fig. 10.6; cf. Hill 1922, 2–3; Pfisterer 2007, 660–61, and the list of reference literature). In this method two plates of stone, or more usually, two slabs of clay were used, each with a series of moulds for the obverse or the reverse of the coins,[19] side by side, with a channel drawn from mould to mould. When the slabs were assembled molten metal was poured through a channel to fill the cavity between them. After cooling, the slabs were separated and casting traces removed from the finished coins (cf. Găzdac and Humer 2008, 44; Găzdac and others 2015, 12). The use of this technology is best identified by finds of fragments of solidified alloy filling the channels between the imprints of coins in the mould ('sprues'). There are various forms of these sprues, some still attached to a coin: flatter (e.g. on the coin

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[19] Sometimes when an impression was taken the coin might shift, creating the effect of a 'double strike' (Fig. 10.8: 1–2, 5–6). Another interesting manufacturing defect is the 'double obverse' effect, where the obverse of the original coin was impressed by mistake in the mould over an earlier imprint of the reverse (Fig. 10.8: 3–4).

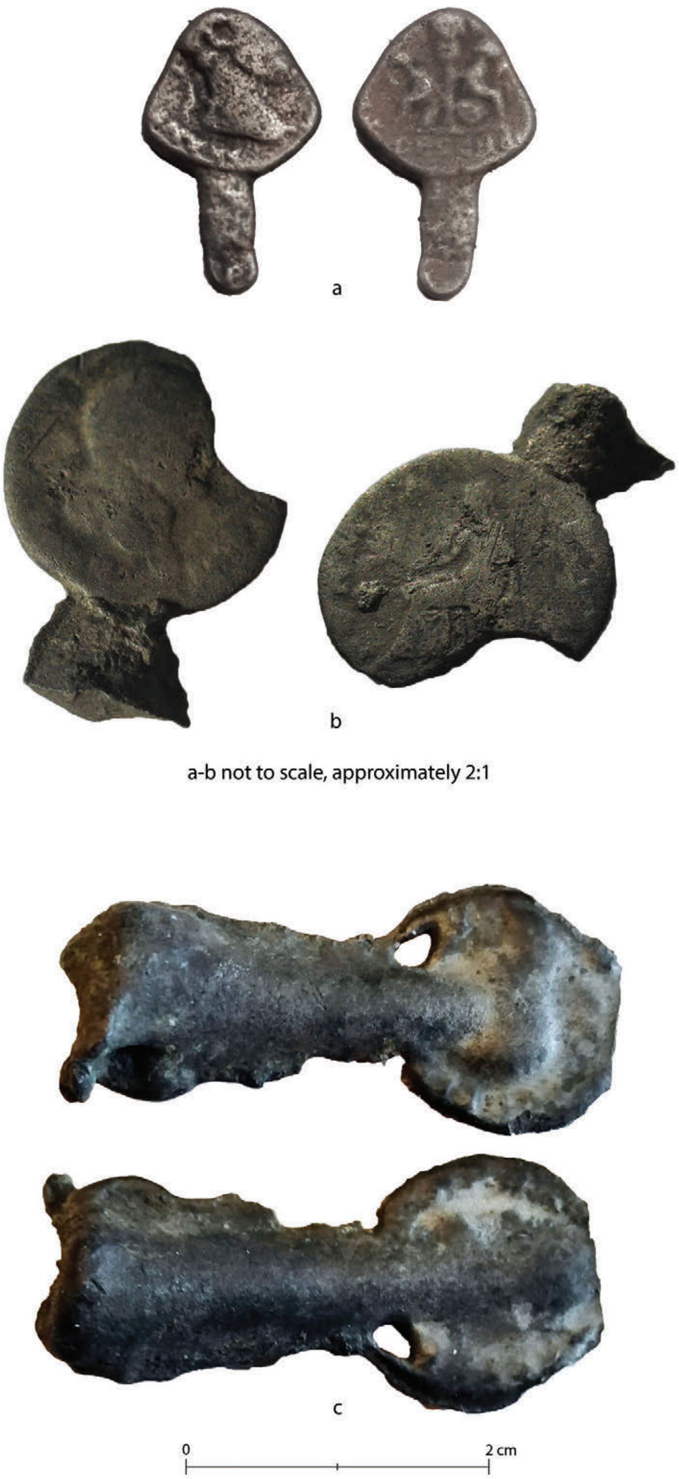

Figure 10.7. Coins with casting sprues found at Klishchiv, Khmelnytsky region, Ukraine (a); Slavuta (environs), Khmelnytsky region, Ukraine (b) and Ozadivka, Zhytomyr region, Ukraine (c) (photo: Oleksander Nadvirnyak (a, c) and Kyrylo Myzgin (b)).

from Klishchiv, Khmelnytsky region: Pohorilets and Nadvirnyak 2022, 18 fig. 8) or cone-shaped (e.g. on the coin from Ozadivka, Zhytomyr region: Pohorilets and Nadvirnyak 2022, 16 fig. 6, or the coin from the vicinity of Slavuta, Khmelnytsky region; Fig. 10.7).

Given the large number of obvious remains from the production of *denarii flati* in the eastern Barbaricum, and of finished coins too, the absence of clay moulds identifiable with the 'coin tree' method is rather odd. This is in absolute contrast to the situation observed within the Empire where thousands of such moulds have been recorded. Perhaps past scholarship is to blame: none of these presumed workshops has been investigated archaeologically, and the clay moulds escaped the notice of metal detectorists, were not recognized by them as such, or simply were not found to be of interest (but this, admittedly, is the least likely option). Nevertheless, it seems rather odd that despite more than two centuries of recording ancient coins in Eastern Europe moulds of this description have never come to the attention of archaeologists, have not come to light during archaeological fieldwork, and were not recorded as casual finds in the pre-metal-detector age. A logical explanation for this phenomenon could be e.g. the use of the lost-wax method. In such case the obtained casting would be of a fairly high quality, and the casting method impossible to document.[20] Another, less likely explanation is that the moulds were destroyed after the production process, or carried to some other place (if we accept the 'itinerant craftsmen' hypothesis). However, in both cases the likelihood of finding fragments of e.g. broken moulds, is still high. It seems to me that if clay moulds are not recorded in the nearest future, particularly when the presumed coin-casting workshops have been investigated by archaeologists, it may be reasonable to assume the lost-wax method as the main technological process. In other words, the use in the 'coin tree' method of slab-moulds made of wax rather than clay.

Apparently, the casting of coins in single moulds, so common within the Empire, was practised within the Barbaricum to a limited extent. In the eastern Barbaricum, in Ukraine, this method is documented by a single bronze mould recovered at Symoniv, Rivne region (Fig. 10.9; Myzgin 2019, 37), unfortunately currently unavailable for direct research. Elsewhere on the territory of the Barbaricum finds of single clay moulds are known only from Scotland, and may have been brought to the area over the border from Roman territory (see above; Holmes and Hunter 2001, 168–69). As may be seen from the earlier discussion, unlike the

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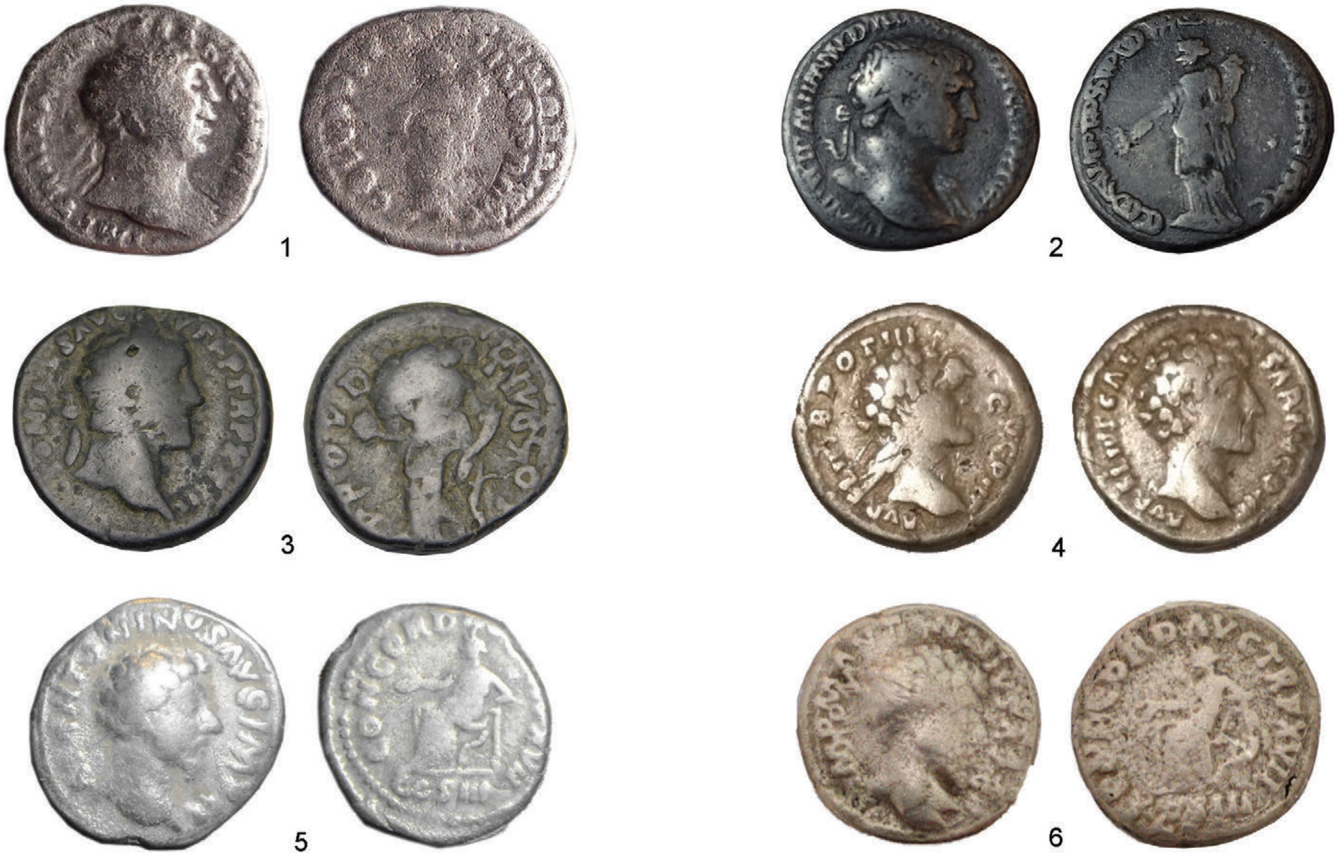
[20] This assumption must also be verified experimentally. I am grateful to Prof. Christopher Howgego for this valuable remark.



Not to scale, approximately 2:1

Figure 10.8. Selected *denarii flati* with a double impression: 1 — Volhynia (?), Ukraine; 2, 5 — Khmelnytsky region, Ukraine; 3 — Ternopil region, Ukraine; 4 — Kelmenets district, Khmelnytsky region, Ukraine; 6 — western (?) Ukraine (photo: Kyrylo Myzgin).

'coin tree' method, production in individual moulds was a cumbersome and complex process, although the end product could be of a good quality (cf. Hill 1922, 4; Hall 2014, 173). It must be said that it is quite difficult to distinguish a coin made using the 'coin tree' method from a coin cast using the 'single mould' process: in both cases there will be traces of the channel down which the metal entered the imprint in the mould. In both processes, once the coins were removed from the moulds, their edges could be trimmed and filed. Even errors of production, such as 'double impression' or misalignment of the obverse imprint relative to the reverse, are characteristic of both these technologies. I think that at present we are only in a position to confirm the existence of single moulds coin-casting technology, whereas the study of the frequency of its use and geographical range is a matter for the future.

Nadvirnyak and Pohorilets also draw attention to a technology similar on the whole to the 'coin tree' process, only with the difference that the metal was

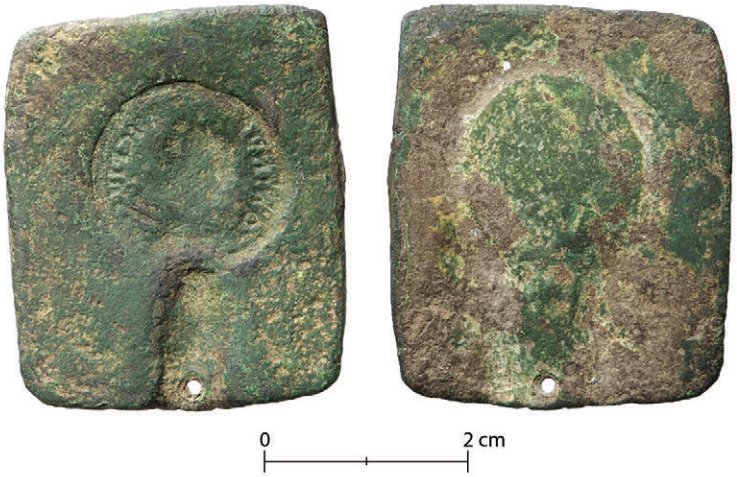
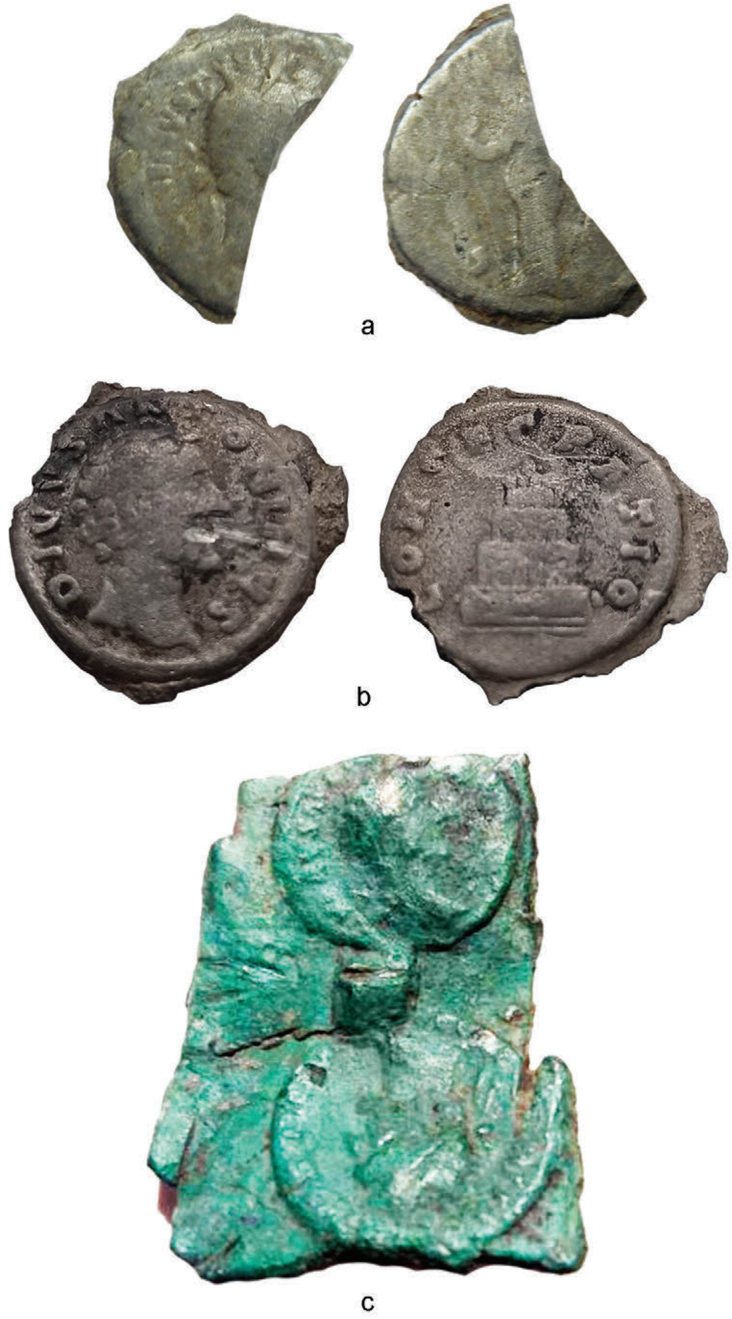


Figure 10.9. Bronze coin mould from Symoniv, Rivne region, Ukraine (after Myzgin 2019, 36 fig. 3).

poured not only into channels made between the impressions, it also filled the space between the two slabs in which the impressions were made, so that the end product was a solid plate of metal with cast coins in it which had to be cut out. One coin apparently manufactured in this way identified among the materials from a settlement complex at Viytenky, Kharkiv region, had marks from the removal of excess metal all over its edge (Fig. 10.10: a; Myzgin and Kodats'kyi 2021, 58 fig. 2: 2). Nadvirnyak and Pohorilets at first referred to this method of production as '*moneta-cappa*' (Nadvirnyak and Pohorilets 2020, 66; Pohorilets and Nadvirnyak 2021, 177, 178), subsequently — 'casting on a slab' (Pohorilets and Nadvirnyak 2022, 8), and in the text of their paper included in this volume — the use of 'slab-moulds'.

Nevertheless, to my mind it may be too early to identify this previously unknown technology. All traces of the use of this 'technology' are more likely to be manufacturing defects, caused by the failure to clamp tightly the two slabs with impressions of coins before filling them with metal, which then spilled into the space around the coins. This is confirmed by a find from an unspecified find-spot in Ukraine, where not only are the coins connected by a channel, they are surrounded on all sides by metal (Fig. 10.10: c). Second, such a defect is seen on coins found among the material from the presumed workshops at Abrykosivka and Korzhivtsi, where as said earlier, the main technology was the 'coin tree' method (Pohorilets and Nadvirnyak 2022, 14 fig. 1: a; see figures in the contribution from these authors in this volume: Fig. 8.1: a; Fig. 8.2: b).[21] Finally, the use of such a technology would have required using an unreasonable amount of metal, would have been labour intensive (where every coin had to be cut out of the metal plate, and needed to be filed all around its edge), associated with a high risk the coin would break owing to the brittleness of the alloy, the coins would have an unattractive appearance (if the excess metal was not completely removed and the edges of the coin were not filed). On the other hand, denarii cast on the back surface of mirrors, now incomplete (Fig. 10.11; one side, on one side of the mirror only, the other side is plain), debars us from fully discounting the use of the technology described Nadvirnyak and Pohorilets. However, its more likely use would have been in the making of mirrors where the images of coins are purely decorative.



Not to scale, approximately 2:1

Figure 10.10. *Denarii flati* with manufacturing defects, from Viytenky, Kharkiv region, Ukraine (a), Mykulyntsi, Vinnytsia region, Ukraine (b), western (?) Ukraine (c) (photo: Kyrylo Myzgin (a) and Oleksander Nadvirnyak (b, c)).

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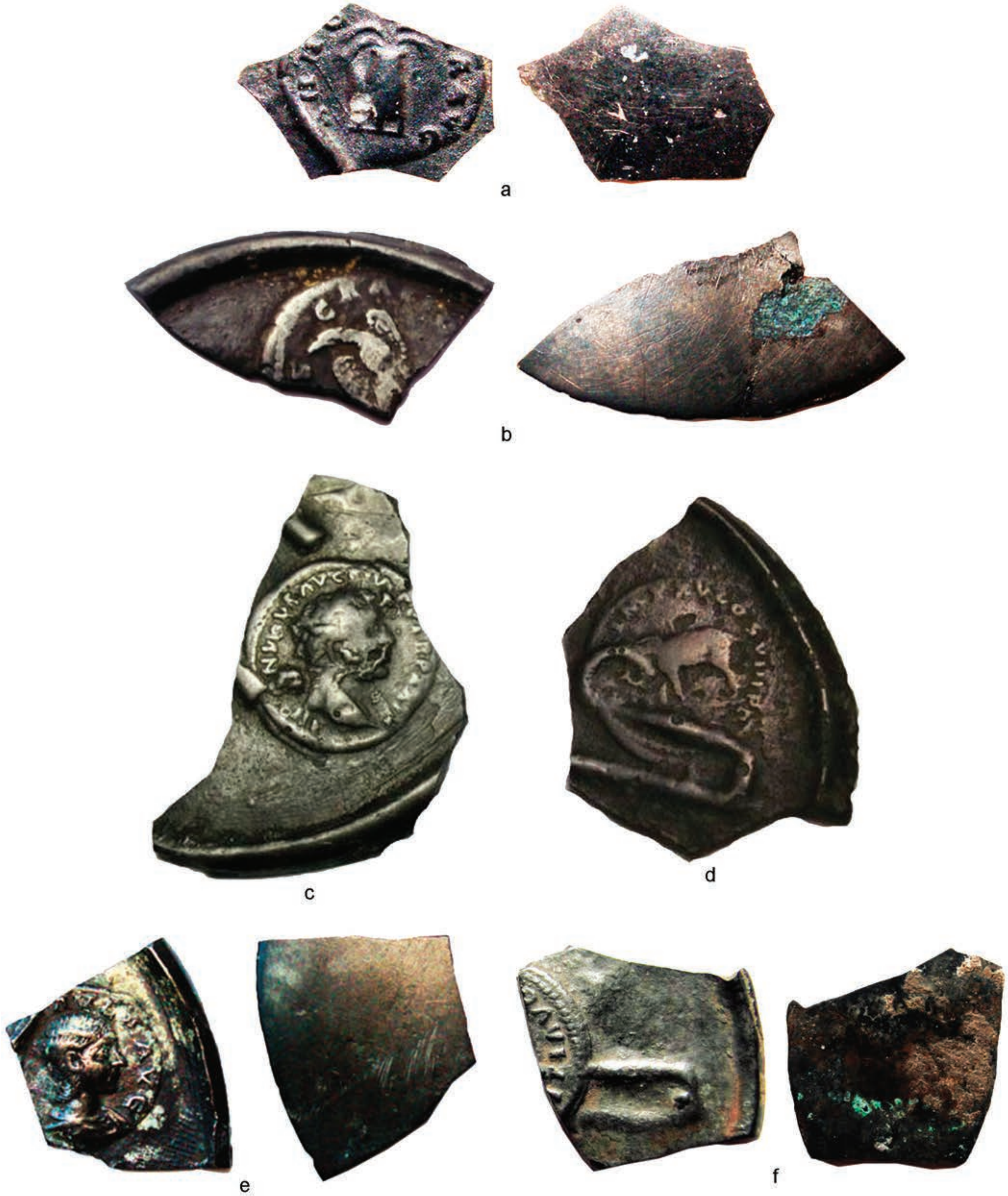
[21] Actually, apparently because of the presence of this manufacturing defect the coins had been discarded by the coiners rather than being put into circulation.



Not to scale

Figure 10.11. Mirrors decorated with cast denarii from an unidentified location in Ukraine (a–e), Abrykosivka, Khmelnytsky region, Ukraine (f) (a, b, e, f — © State Historical and Cultural National Reserve 'Medzhybizh', photo: O. Nadvirnyak, O. Pohorilets; c, d — Anokhin 2015, 11 fig. 8: 1–2).

Table 10.1. Composition of alloy of *denarii flati* recovered in different regions of the Barbaricum. Abbreviations in Colour column: S — silver colour; Sy — silvery; RC — red copper; YC — yellow copper; GC — gold copper; SC — silver copper; G — grey.

Nos.	**Find spot**	**Group**	**Main components, >10% (+additions: >1%)**	**Colour**	**Cu**	**Sn**	**Pb**
1	Klishchiv, UA	Ag	Ag(+Cu)	S	4,171	0,822	0,76
2	Korzhivtsi, UA (few specimens)			S	4,105 - 4,412	0	0
3	Rubel'-Berezhnoe, BY		Ag(+Cu+Pb)	S	7,84	0	1,06
4	Yakhremenki, UA		Ag(+Cu+Au)	S	3,461	0	0,769
5	Stavishche, BY		Ag(+Pb+Cu)	S	2,28	0	3,33
6	Stavishche, BY			S	2,08	0	3,18
7	Klimovichi, BY		Ag(+Pb+Sn+Cu+Fe)	S	3,3	3,73	5,04
8	Domachevo, BY		Ag(+Fe)	S	0	0	0,89
9	Dunayevets' (environs), UA		Ag+Cu	S	38,416	0	0,076
10	Birnie, SC			S	14	?	?
11	Chankiv, UA		Ag+Cu(+Zn)	S	13,65	0	0
12	Grushevo, BY		Ag+Sn+Cu(+Pb)	S	19,28	23,71	4,87
13	Mukariv/cemetery, UA	Cu	Cu	RC	98	0	0
14	Kam'yanets-Podilskyi (environs), UA		Cu(+Zn)	RC	90,78	0	0,112
15	Kam'yanets-Podilskyi (environs), UA			RC	92,789	0	0,13
16	Kormilche, UA		Cu(+Sn)	RC	69,35	4,02	0,4
17	Bol'shye Reksti, BY		Cu(+Sn+Pb)	RC	96,23	1,94	1,83
18	Bezverchovichi, BY		Cu(+Pb+Sn)	RC	89,76	5	5,23
19	Bezverchovichi, BY			RC	89,89	4,56	5,55
20	Bezverchovichi, BY			RC	90,8	3,68	5,52
21	Bezverchovichi, BY			RC	94,2	2,52	3,29
22	Velemichi, BY		Cu(+Pb+Sn+Ag)	RC	89,1	2,85	5,34
23	Kormilche, UA		Cu(+Pb+Sn+Fe)	YC	27,9	6,89	21,51
24	Chankiv, UA		Cu+Sn	GC	37,64	18,65	0,57
25	Văleni, RO			SC	70,16	28,35	0,43
26	Dumitreştii Gălăţii, RO		Cu+Sn(+Pb)	YC	84,81	10,28	4,34
27	Vileyski district, BY			GC	80,96	13,14	5,91
28	Văleni, RO			GC	79,64	14,32	4,96
29	Văleni, RO			GC	76,64	14,84	7,31
30	Brest (environs), BY			SC	75,8	21,02	3,18
31	Chankiv, UA			SC	38,04	21,26	4,34
32	Kormilche, UA			SC	42,55	25,61	15,77
33	Syvorogy, UA			SC	60,22	27,21	3,76
34	Mukariv/settlement, UA			SC	44,58	28,62	16,65
35	Chankiv, UA			SC	56,44	29,04	10,91
36	Mukariv/settlement, UA			SC	61,71	31,42	4,76
37	Kormilche, UA			SC	45,63	31,95	11,71
38	region of Podillya, UA			SC	61,2	32,02	4,989
39	Gródek, PL			SC	60,48	32,72	5,28
40	Gródek, PL			SC	61,93	33,74	3,35

Zn	Ag	Fe	Au	Si	Al	Other additions (>1%)	Other additions (<1%)	Method of analysis
0	90,01	0,129	0	3,32	0		Fe, Al, Ca, S	PIXE
0,50 - 0,129	92,836 - 94,956	0	0,594 - 0,650	0	0			XRF
0,19	90,54	0,36	0	0	0		?	LIBS
0	94,222	0	1,014	0	0		Fe, Ca	XRF
0,29	93,38	0,71	0	0	0		?	LIBS
0	94,74	0	0	0	0			LIBS
0,43	86,34	1,15	0	0	0		?	LIBS
0	97,5	1,61	0	0	0			LIBS
0	61,265	0	0,246	0	0		?	XRF
?	84	?	?	0	0		?	XRF
1,18	84,37	0	0,8	0	0			XRF
0	51,7	0,45	0	0	0			LIBS
0,92	0	0,19	0,29	0,15	0		Co, Ni, P	XRF
8,94	0,46	0	0,1	0	0		Ni	XRF
6,07	0,68	0	0,19	0	0		Ni	XRF
0	0	0,27	0	16,43	2,4	P = 6,98	Ti	XRF
0	0	0	0	0	0			LIBS
0	0	0	0	0	0		?	LIBS
0	0	0	0	0	0			LIBS
0	0	0	0	0	0			LIBS
0	0	0	0	0	0			LIBS
0	2,02	0,69	0	0	0			LIBS
0,35	0,05	3,03	0	33,62	6,1		Ti, Cd	XRF
0,08	0	1,27	0	31,87	9		P, Ti, Mn, Sb	XRF
0,17	0,18	0,2	0	0	0		Sb, As, Zr, Ti, Co	XRF
0,57	0	0,17	0	0	0			XRF
0	0	0	0	0	0			LIBS
0,14	0,9	0,39	0	0	0		Sb, As, Zr, Ti, Co	XRF
0,22	0,21	0,23	0	0	0		Sb, As, Zr, Ti, Co	XRF
0	0	0	0	0	0			LIBS
0,18	0,07	1,31	0	25,38	7,8		P, Ti, Ni, Mn, Cd, Sb	XRF
0	0,2	0,61	0	11,07	3,3		Ni, Cd, Sb	XRF
0	0,05	0,14	0	5,43	2		P, Ni, Cd, Sb	XRF
0,23	0,03	0,38	0	6,73	2,7		Ni, Cd	XRF
0,1	0,1	0,16	0	2,28	1			XRF
0	0	0,1	0	0,93	0		P, Mn, Ni, Sb	XRF
0	0,21	0,31	0	8,04	2		Mn, Ni, Cd	XRF
0,52	0,837	0,084	0	0	0		?	XRF
0,73	0,14	0,22	0	0	0		As, Sb, Bi	XRF
0	0,07	0,86	0	0	0		Bi, Sb, As	XRF

Nos.	Find spot	Group	Main components, >10% (+additions: >1%)	Colour	Cu	Sn	Pb
41	Husynne, PL			SC	61,58	35,72	2,03
42	Mukariv/cemetery, UA			SC	43,35	35,8	3,03
43	Supruty, RUS			SC	58,61	39,03	1,65
44	Hanivka, UA			SC	56,05	39,96	1,3
45	Kormilche, UA			SC	43,11	40,21	2,09
46	Ossolineum coll. (J43), PL		Cu+Sn(+Pb+Zn)	YC	81,34	11,47	3,58
47	Kormilche, UA			SC	47,87	22,27	4,09
48	Syvorogy, UA			SC	53,01	22,93	2,51
49	Mukariv/settlement, UA			SC	55,21	28,61	5,61
50	Syvorogy, UA			SC	44,93	28,95	3,59
51	Syvorogy, UA			SC	51,5	30,71	6,81
52	Syvorogy, UA			SC	60,2	31,06	2,09
53	Syvorogy, UA			SC	51,2	31,51	5,73
54	Mukariv/settlement, UA			SC	42,37	39,25	7,79
55	Kormilche, UA		Cu+Sn(+Pb+Fe)	GC	39,87	19,52	4,68
56	Chankiv, UA			SC	30,25	25,37	5,38
57	Vinnytsia region 2, UA			SC	43,81	36,25	13,16
58	Chernavchitsy, BY		Cu+Sn(+Pb+Ag)	SC	68,77	23,95	5,28
59	Velemichi, BY		Cu+Sn(+Ag+Pb)	GC	70,55	13,41	5,39
60	Mukariv/settlement, UA		Cu+Sn(+Pb+Zn+Sb)	SC	57,26	27,27	9,86
61	Ossolineum coll. (GPS355), PL		Cu+Sn(+Fe)	SC	56	39,81	0,98
62	Byl'chicy, BY		Cu+Pb(+Sn)	DC	73,94	8,54	17,52
63	Bezverkhovichi, BY			DC	82,22	5,2	12,57
64	Gródek, PL		Cu+Pb(+Zn+Sn)	DC	58,18	3,02	32,07
65	Yatvesk, BY		Cu+Pb+Sn	DC	69,7	14,83	15,46
66	Kormilche, UA			DC	34,17	21,65	28,78
67	Ossolineum coll. (J15), PL			DC	66,39	13,03	19,91
68	Mukariv/settlement, UA		Cu+Sn+Pb(+Zn)	DC	46,1	28,9	10,36
69	Ossolineum coll. (J40), PL		Cu+Sn+Pb(+Ag)	DC	58,14	28,01	10,16
70	Viytenky, UA			DC	52,84	28,74	12,71
71	Zhirmuny, BY	Sn	Sn+Pb	G	0	57,71	42,02
72	Syvorogy, UA		Sn+Cu(+Pb)	G	40,9	44,09	4,1
73	Viytenky, UA			G	43,19	54,5	1,59
74	Syvorogy, UA			G	38,79	43,62	6,81
75	Viytenky, UA			G	18,45	63,29	16,83
76	region of Podillya, UA			G	37,8	50,18	10,638
77	Viytenky, UA		Sn+Cu(+Pb+Zn)	G	26,89	60,35	4,8
78	Mukariv/settlement, UA		Sn+Cu(+Pb+Fe)	G	34,88	42,3	6,62
79	Mukariv/settlement, UA			G	28,01	37,64	6,49
80	Viytenky, UA			G	42,83	44,52	9,2
81	Vinnytsia region 1, UA*			G	15,5634	34,5562	9,4654
82	Viytenky, UA		Sn+Cu+Pb(+Ag+Fe)	G	27,22	56	10,84

Zn	Ag	Fe	Au	Si	Al	Other additions (>1%)	Other additions (<1%)	Method of analysis
0,21	0,07	0	0	0	0		Bi, Sb, As	XRF
0	0,29	0,73	0	11,15	4,5	P = 1,11	Ni	XRF
0	0	0,26	0	0	0		?	XRF
0	0,12	0,62	0	0	2			XRF
0,67	0,06	0,6	0	8,65	3,2	P = 1,2	Ti, Ni	XRF
3,12	0	0,48	0	0	0			XRF
3,02	0	0,56	0	16,95	5,1		Cr, Ni, Cd	XRF
3,81	0	0,32	0	13,09	4,2		Mn, Ni	XRF
1,19	0,06	0,18	0	6,51	2,5		Ni, Cd	XRF
3,16	0	0,44	0	13,3	4,5	P = 1,08	Ni	XRF
1,32	0,09	0,26	0	7,02	2,2		Mn, Ni	XRF
2,86	0	0,17	0	0	2,6		P, Ni, Cd	XRF
2,95	0,11	0,18	0	6,24	1,9		Cr, Ni, Cd	XRF
3,51	0	0,27	0	5,35	1,3		Ni	XRF
0,2	0,05	1,7	0	27,37	6,2		Ti, Sb	XRF
0	0,06	1,42	0	29,9	7,2		Ni, Cd	XRF
0	0,09	1,08	0	4,23	0,9		Sb	XRF
0	1,81	0,19	0	0	0			LIBS
0,44	9,87	0,34	0	0	0			LIBS
2,8	0,07	0,23	0	2	1	Sb = 1,43	Ni	XRF
0,35	0	1,84	0	0	0		As, Mn	XRF
0	0	0	0	0	0			LIBS
0	0	0	0	0	0		?	LIBS
6,4	0,06	0	0	6	0		Sb, Bi	XRF
0	0	0	0	0	0		?	LIBS
0,69	0	0,51	0	6,29	0,9	P = 6,19	Cd, Sb	XRF
0,41	0	0,24	0	0	0			XRF
1,89	0	0,55	0	9,7	2,4		Co, Ni, Cd	PIXE
0,66	2,32	0,57	0	0	0			XRF
0	5,4	0	0	0	0		?	PIXE
0	0	0,27	0	0	0			LIBS
0,31	0,19	0,7	0	7,16	2,4		P, Co	XRF
0,31	0	0,08	0	0	0		?	PIXE
0,31	0,19	0,37	0	7,31	2,6		Cr, Ni	XRF
0,15	0	0,99	0	0	0		Ti, V, Mn, Ni	PIXE
0,093	0,263	0,864	0	0	0		Ni	XRF
4,42	0	0,93	0	4	0		?	PIXE
0	0	1,27	0	9,86	2,9	P = 1,88	Cr, Ni, Sb	XRF
0	0,05	1,27	0	19,92	6,1		Ti, Cr, Ni, Cd, Sb	XRF
0,43	0	1,81	0	0	0		Ca, Ti, Mn, Ni	PIXE
0,6848	0,171	1,3355	0	23,195	8,2	P = 3,46; K = 1,3; Ca = 1,1	Ti, Cr, Mn, Ni	PIXE
0	4,5	1,04	0	0	0		Ti, V, Cr, Ni	PIXE

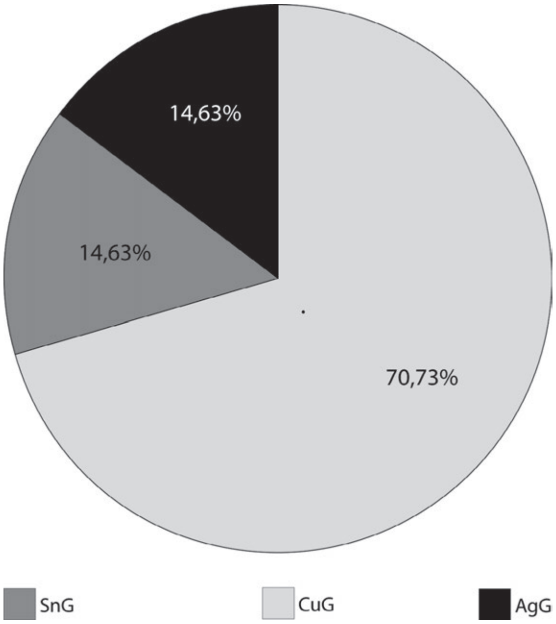


Figure 10.12. Percentage of samples listed in Table 10.1 by group (drawing: Kyrylo Myzgin).

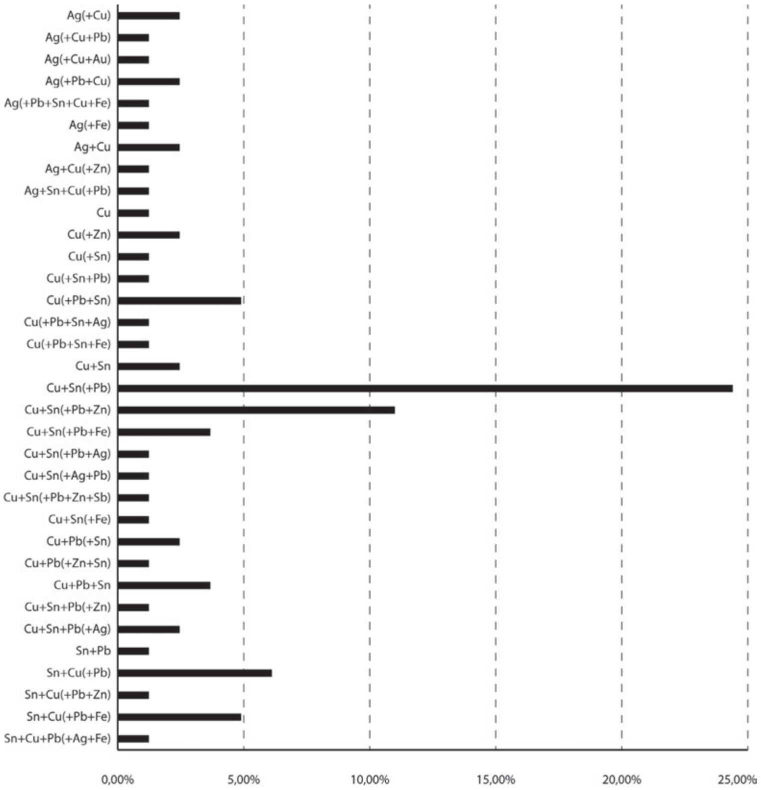


Figure 10.13. Percentage of alloy types listed in Table 10.1 (drawing: Kyrylo Myzgin).

Alloy Composition Studies[22]

The largest number of chemical analyses were for *denarii flati* finds from Eastern Europe, elsewhere such studies are few in number. Chemical composition data on eighty-two *denarii flati* known to me are presented in Table 10.1. However, before moving on to the analysis of this data let me note that it is extremely difficult to draw a general picture, first of all from a methodological point of view. The data collected in Table 10.1 were obtained at different times (the earliest in 2006, the latest in 2022), in different countries (Ukraine, Belarus, Poland, Romania, Russia, Scotland), by different methods (PIXE, LIBS, XRF). Especially the latter is worth considering as this may significantly distort the objective picture. While the results of Laser-induced breakdown spectroscopy (LIBS) and Particle-induced X-ray emission (PIXE) are more reliable, enabling more in-depth analysis, the X-ray fluorescence (XRF) method collects data from the surface of the sample, with greater or lesser accuracy (depending on the type and model of the equipment). Other than that, sample preparation was found to have a considerable impact on the analysis. For instance, coins not subjected to conservation treatment retain a substantial amount of contamination associated with the environment in which they had been found (Si, Al, P — marked grey in the table), which directly affected the objectivity of analysis. Thus, Table 10.1 can only help understand some of the trends, and a more objective and accurate picture can be obtained only based on a large series of analyses, all made using one and the same method, preferably the same equipment.

The data collected in Table 10.1 show an impressive diversity of alloy types used in making the *denarii flati* within the Barbaricum. Previously, using the data from the analysis of individual assemblages the alloys were assigned by some researchers into several groups. For instance, based on a substantial series of XRF analyses of *denarii flati* from the presumed coining workshops at Korzhivtsi, Abrykosivka, Kormylche, Oleksandr Nadvirnyak and Oleh Pohorilets distinguished two types of alloy: copper-based (48.5 up to 99.17 per cent) and silver-based (92.8 up to 94.95 per cent) (Nadvirnyak and Pohorilets 2019, 33–34; 2020, 66; Pohorilets and Nadvirnyak 2021, 176–77; 2022, 20–21). Using the results furnished by PIXE analysis of *denarii flati* found on the territory of the Chernyakhiv culture to the east of the River Dnieper, Kyrylo Myzgin and Serhiy Kodats'ky

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[22] A warm thank you to Dr hab. Arkadiusz Dymowski, Dr Oleksandr Buhay, Prof. Barbara Wagner, and Dr Aleksandra Towarek for expertise and advice given during my work on this chapter.

(2021, 53–54) distinguished three alloy groups: alloys based on copper, lead, and tin, with a predominance of lead (Group 1); based on copper and tin, with an approximately the same content of tin and copper (Group 2); based on copper, lead, and tin, with a significant predominance of copper (Group 3). Vital Sidarovich and Ksenia Ermalitskaia (2021, 275) made a study of the *denarii flati* from Belarus using LIBS, and distinguished four alloy groups: with an absolute dominance of copper and small amounts of lead and tin (up to 5 per cent) (Group 1); with a predominance of copper, but also a relatively high content of tin (up to 23 per cent) and/or lead (up to 17 per cent) (Group 2); with a predominance of lead (up to 56 per cent) and tin (31 per cent and more) (Group 3); with a predominance of silver (between 51 per cent and 97 per cent) (Group 4).

Now, with this general idea about the results of chemical analyses of *denarii flati* from the different parts of Barbaricum can we distinguish groups of alloys common for its entire territory? For instance, in 1972, based on an analysis of 623 objects made of non-ferrous metals associated with the Chernyakhiv culture (most of them site finds and grave finds), Tatyana Bartseva, Galina Voznesenskaya, and Evgeny Chernykh (1972, 58 table 1) recognized six types of alloy characteristic of the whole Chernyakhiv culture.[23] This typology is based on the main components of the alloys as well as their number. Other, more complex classifications exist, marked by greater precision, some developed specifically for the study of archaeological alloys. For instance, in developing their classification of copper alloys, Mark Pollard and his research team (2018, 86 table 1) focused on four elements (primarily for practical reasons) — on the absence/presence of arsenic (As), antimony (Sb), nickel (Ni), and silver (Ag), which led them to obtain sixteen possible 'Copper Groups' (copper alloy types). Had they used five elements, they would have obtained thirty-two 'Copper Groups', and so on (Pollard and others 2018, 85). I suspect this approach would not serve in the case of our assemblage of *denarii flati* where we might have to focus on seven elements, and have to deal with 128 types of alloy. This would made our study unnecessarily cumbersome, the results almost impossible to interpret.

The data assembled in Table 10.1 were used to distinguish three main alloy groups, named for their main element, the leader in terms of its content in the alloy: Silver Group (AgG), Copper Group (CuG), and Tin Group (SnG) (Fig. 10.12). Next, within each group, I classified the alloys depending on the number of their components: a) single-component, where the main element of the group makes up an absolute majority (over 90 per cent), and all the other elements make up less than 10 per cent; b) two-components, where the main elements of the alloy each account for more than 10 per cent, with the principal element predominating; c) multi-component, with three and more main elements (each over 10 per cent), with the main principal element predominating. In my view, this rather conventional division affords a good insight into the main quantitative trends of alloy use (Fig. 10.13).

In the Silver Group (AgG), which accounts for 14.63 per cent of the total number of samples from Table 10.1, single-component alloys prevail, containing most often, next to Ag, elements such as Cu, Pb, and sometimes, Fe. Group CuG accounts for an overwhelming number of samples from Table 10.1 — 70.73 per cent. Here single-component and multi-component alloys are significantly outnumbered by two-component alloys. Among the latter copper and tin are unquestionably the most dominant, while other elements include Pb, Zn, Fe, and Ag. As we know, lead-tin bronzes are among the most common archaeological alloys (cf. Mecking 2020, 2). For one, they are prevalent on the territory of the Chernyakhiv culture (Bartseva and others 1972, 59). All of the multi-component alloys in Group CuG, represented by the smallest number of samples, are a combination of Cu, Sn, and Pb, known otherwise as 'potin'. Finally, Group SnG is represented by two-component and multi-component alloys, of which the former prevail. The majority of the two-component alloys are bronzes (Sn+Cu), but with a higher content of tin than copper.

The diversity of the alloys, and in particular, of their secondary components, shows that the ancient coiners did not strictly adhere to any single recipe and, most likely, used the raw materials at hand, possibly obtained by recasting old items. This is something pointed out recently by Sidarovich and Ermalitskaia (2021, 278). However, were the ancient masters guided by the availability of raw materials only when they made the *denarii flati*, and in their choice of alloy for this production? If so, then we would expect a greater diversity and number of alloys whereas Table 10.1 suggests certain trends in the use of the main elements for alloys. It seems that the colour of the alloy also played an important role (see the column 'Colour' in Table 10.1). Incidentally, the issue of the colour range of archaeological metal alloys has recently come under closer scrutiny (cf. Mödlinger and others 2017; Devogelaere 2017; Radivojević and others 2018; Mecking 2020).

In a scheme proposed for copper-based alloys by Marianne Mödlinger and her research team (2018, 86,

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[23] Group I: brass, Cu+Zn+(Pb); Group II: multi-component, Cu+Zn+Sn+(Pb); Group III: multi-component, Cu+Sn+Zn+(Pb); Group IV: tin- or lead-tin bronzes, Cu+Sn+(Pb); Group V: 'pure copper', Cu; Group VI: billon, Cu+Ag.

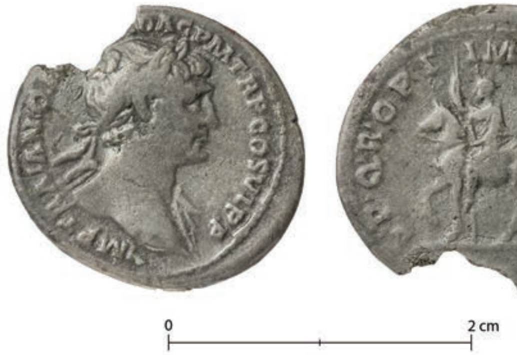

Figure 10.14. *Denarius flatus* from Husynne, Lublin voivodeship, Poland (Myzgin 2021, 475 no. 30).

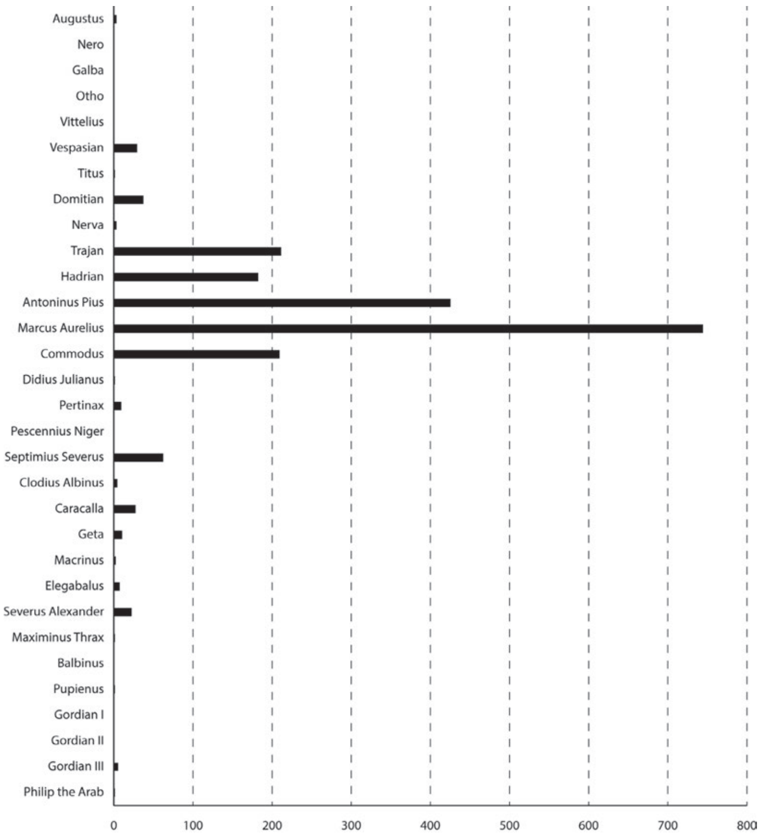

Figure 10.15. Prototypes of *denarii flati* from Ukrainian finds (data for 2012–2013, 2021–2022) (data and drawing: Kyrylo Myzgin).

table 1), the colour of the alloy varied depending on the content of tin. For instance, the albescence or a lower tin content gives the alloy a red hue (red copper), whereas a tin content of between 5 and 12 per cent produces a yellow (yellow copper), between 12 and 20 per cent — a golden (gold copper), and over 20 per cent — a silvery hue (silver copper) (Mödlinger and others 2017, 22, table 2). In Group CuG more than a half of the samples (thirty out of fifty-eight) can be described as 'silver copper', an alloy identified in artefacts found in different parts of the Barbaricum. In appearance, alloys containing around 20 per cent or more tin are very similar to Ag+Cu alloys which have a silver content of 72 per cent (Mecking 2020, 112). Tin-based alloys, where copper is the second main element, are in various shades of grey (the higher the tin content, the deeper the grey hue) (Radivojević and others 2018, 116 fig. 9; see also: Fang and McDonnell 2011, 56–57). Coins made of potin were dark grey, even black.[24] In other words, the appearance of such items had to at least resemble the original silver coins to the owner, unless of course, they were essentially silver coins (coins in Group AgG).

It is interesting that in Cu+Sn alloys the desired colour was obtained by having a higher tin content, but this caused the alloy to lose its ductility. In general, tin is added to improve the casting properties of an alloy, by lowering the melting point and hardening the bronze, but a high tin content makes the alloy more brittle. This effect is lessened by adding lead to the alloy (it also lowers the melting point and increases ductility), which should not exceed 5 per cent either (Devogelaere 2017, 6–7; see also: Rama 1995, 279–80). In fact, the alloy in Group CuG with the best properties for coining is Cu+Sn(+Pb), with a moderate tin content (below 20 per cent) and lead at 5 per cent at the most. As noted earlier the silvery hue is obtained by increasing the content of tin, causing brittleness of the alloy. An excellent example of this is e.g. a pierced *denarius flatus* of Trajan found at Husynne, in Lublin region, in eastern Poland (Fig. 10.14; Myzgin 2021, 475 no. 30). The coin has a silvery hue, and a fracture where the hole would have been. Its material is Cu+Sn(+Pb) alloy, where the tin content is as much as 35.72 per cent (with lead at 2.03 per cent), which explains the coin's noticeable brittleness. The coin could have become chipped either when an attempt was made to pierce it, or during use as a pendant. Evidence that the primary concern in casting coins was its appearance and not the ductility of the alloy.

At the same time, some of the cast copies are definitely far from resembling silver pieces in their appearance. One possible explanation is that they are blanks for subaerate coins, or subaerate cores that had lost their plating, but more evidence is needed to substantiate this claim.

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[24] Which prompted Mikhail Choref (2012, 158) to use the term *moneta nigri*.

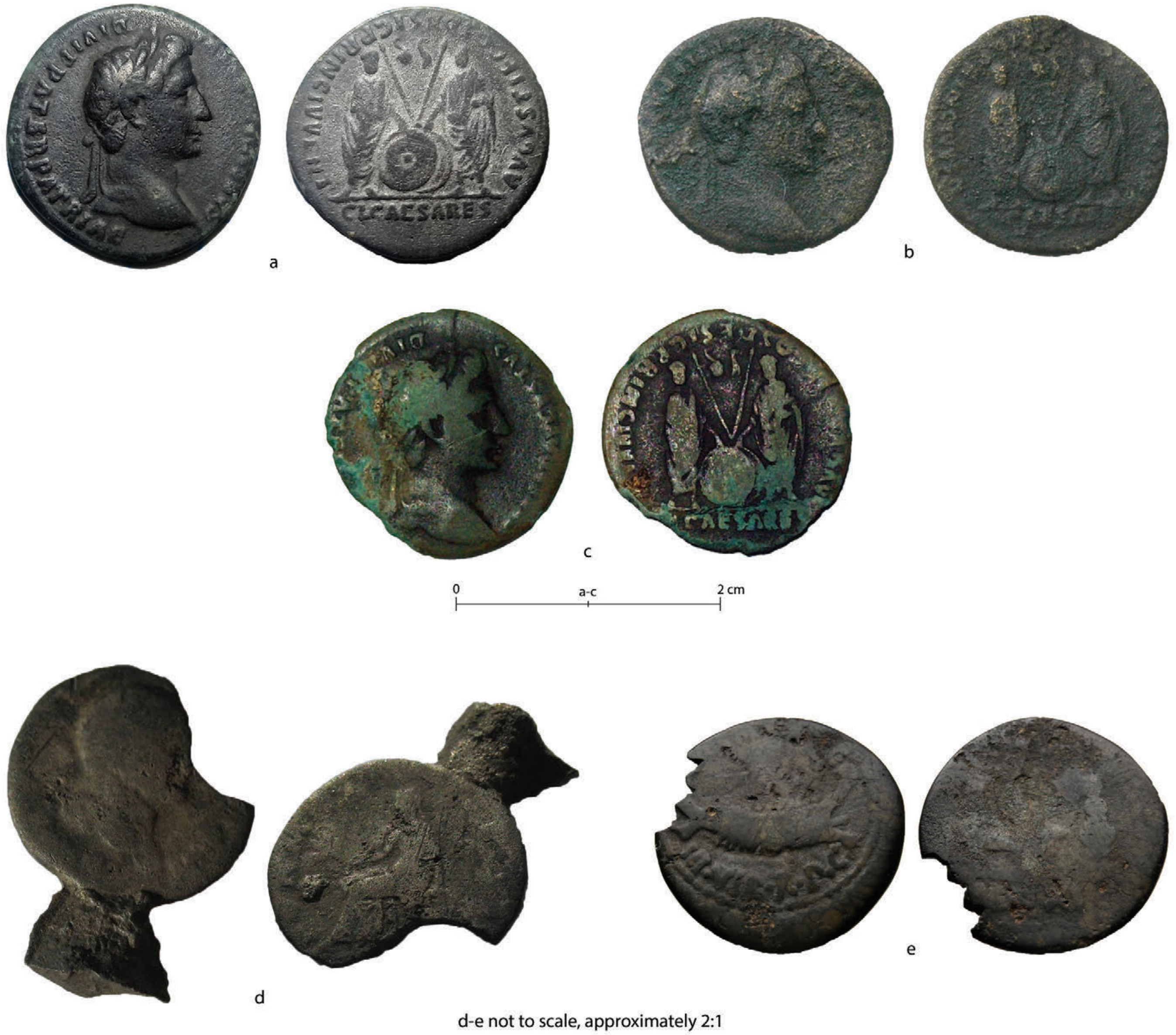
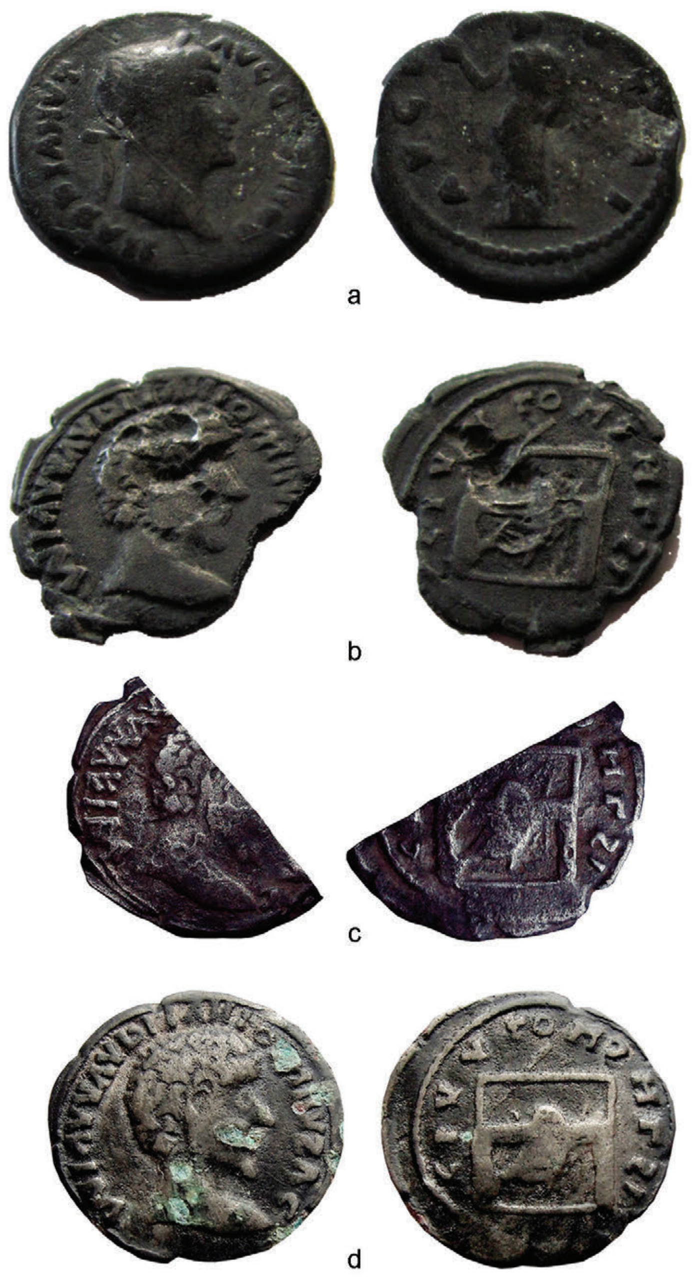


Figure 10.16. *Denarii flati* with the earliest prototypes: a, b — Khmelnytsky region, Ukraine; c, e — Chernivtsi region, Ukraine; d — Slavuta (environs), Khmelnytsky region, Ukraine (photo: Kyrylo Myzgin).

Chronology of Manufacture

The chronology of production of *denarii flati* in the Barbaricum cannot be easily determined, if only because of the lack of archaeologically investigated and/or published coin-casting workshops.

As noted earlier, the dating of the manufacture of *denarii flati* within the Roman Empire is assisted by the dating of their prototypes. For the territory of the European Barbaricum the only more complete data at my disposal on prototypes of the *denarii flati* come from Ukrainian finds, all of them lacking information about the context of their discovery and known from what has been published on the internet (see above; Fig. 10.15). Amongst this material, prototypes predating the reforms of Nero are extremely rare. They include three *denarii flati* of Augustus with the 'Gaius and Lucius' reverse (Fig. 10.16: a–c), a single legionary denarius of Mark Antony, one of a series of coins known to continue in circulation until the third century (Fig. 10.16: e). Coins copying the denarii of the Flavian dynasty are similarly rare — most of them are *denarii flati* with a portrait of Vespasian and Domitian. One remarkable coin found in the vicinity of the locality Slavuta in Khmelnytsky



Not to scale, approximately 2:1

Figure 10.17. Cast barbarian imitation denarii from presumed workshops at Abrykosivka, Khmelnytsky region, Ukraine (a–b), imitations from Yarmolyntsi (c) and Nova Ushytsia districts, Khmelnytsky region, Ukraine (d) (after Anokhin 2015, 187 no. 939; <http://barbarous-imitations.narod.ru/index/1361_1440/0–629> [accessed 27 June 2023]).

region had a portrait of Nero and a casting sprue (Fig. 10.16: d). Nevertheless an absolute majority of prototypes are issues of the Nerva–Antonine dynasty. Of these, the largest number are *denarii flati* with the portrait of Antoninus Pius, Marcus Aurelius, and their families. Coins of Severan emperors are much less frequent, with the most-copied denarii being those of Septimius Severus (n.b., his early issues), Caracalla, and Severus Alexander. Among the small number of later prototype coins are issues of Gordian III. The same chronological structure is reflected by the materials from the presumed coin-casting workshops at Abrykosivka, Zagintsi, Korzhivtsi, and Kormylche,[25] where the absolutely dominant prototype are issues of Nerva–Antonine emperors. The latest prototype recorded at Korzhivtsi only is a denarius of Severus Alexander (see Fig. 8.1: d in the text of Nadvirnyak and Pohorilets in this volume). On the whole the same chronological structure is observed in other parts of the European Barbaricum, e.g. Romania, Poland, Germany, and Denmark, where the largest number of coins have prototypes in late first–second-century Roman issues (reference literature, see above). Only the coin moulds found in Scotland have as their prototypes denarii issued in the reign of Caracalla, Elagabalus, and Gordian III (Holmes and Hunter 2001, 168–69). Similarly, the mould from Newstead, Roxburghshire, Scotland, has impressions taken from the obverse of a denarius of Caracalla and the reverse of an Aurelian coin (Holmes and Hunter 2001, 169, also the paper by Fraser Hunter in this volume).

As is well known, denarii of the first–second centuries make up an absolute majority in the pool of finds of *denarii flati* from the territory of the Barbaricum (see overview in Dymowski 2020, 25–26, and the list of reference literature), with coins of Nerva–Antonine emperors in an absolute majority — issues of Antoninus Pius, Marcus Aurelius, and Commodus. This means that the cast copies were made using those coins that were most widespread in barbarian territories as prototypes.

However, is it legitimate to base the chronological determinations for the manufacture of *denarii flati* within the Barbaricum on the chronology of their prototypes as in the case of their finds within the Empire? The answer to this question lies in the chronology of the influx of the prototypes, i.e. of the denarii to different regions of the Barbaricum. We need to bear in mind that these Roman coins found their way to most of these regions with some delay: a somewhat shorter delay in the case of Central Europe and southern Scandinavia, and a far longer one in the case of Eastern Europe and possibly also the territory of modern Sweden (see Dymowski and Myzgin 2014 with a list of reference literature). In other words, we can say that on the territory of the Barbaricum imperial denarii were actively circulated at a time when in the Roman Empire they started going out of circulation, or had been fully withdrawn from it. That is why the chronology of prototypes cannot be decisive for determining the chronology of the manufacture of *denarii flati* in the Barbaricum. Except for Scotland, where the dating of the prototype coins apparently mostly coincides with the time of their production (in the main, between the 230s and 260s, but given the impressions on the mould from Newstead, the manufacture may have continued until the mid- or late 270s), which is related to proximity to the main centres of counterfeiting in the Empire at the time. For the rest of the territory of the Barbaricum the question of the time frame of the coin casting must be based for the present on circumstantial evidence.

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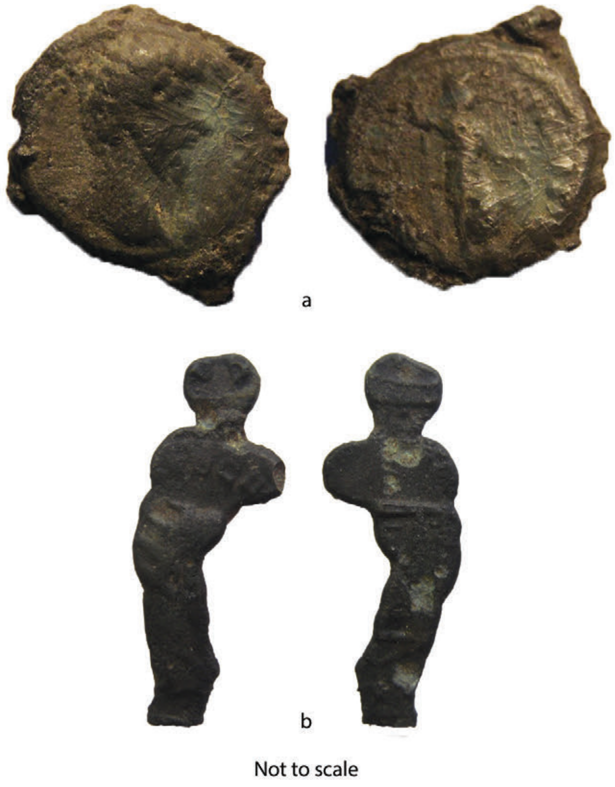
[25] Data based on photographic images made available by Oleksandr Nadvirnyak and Oleh Pohorilets. I thank my colleagues for this information.

In Eastern Europe the production and use of *denarii flati* is associated with the territory of the Chernyakhiv culture, where many of these coins have been recovered on sites of this culture. The Chernyakhiv culture came into being in the first half/mid-third century between the upper reaches of the Southern Bug and the middle reaches of the Dniester in connection with the East Germanic Goths' arrival in the region. In the early fourth century its territory expanded south (to the north-western Black Sea region), east (to between the Dnieper and the Seym), and west (to the region between the Dniester and Olt Rivers). Traditionally the decline of the Chernyakhiv culture is dated to the first half/middle of the fifth century (Magomedov 2001, 134–47; cf. recently: Dymowski and Myzgin 2021b, 195–96, and the list of reference literature). Thus, the production of *denarii flati* cannot be dated earlier than to the first half/mid-third century. This is supported by finds of cast copies of barbarian imitation denarii. At least two were found at the presumed casting workshop at Abrykosivka (Fig. 10.17: a–b). One of these imitations has at least two 'die'-linked cast analogies, found at a fairly large distance from this presumed casting workshop (Fig. 10.17: c–d): in the Yarmolyntsi and Nova Ushytsia districts of the Khmelnytsky region. The production of imitation denarii in the Chernyakhiv culture is thought to start not earlier than in the first half of the third century, and even more likely — not earlier than around the middle of third century (cf. Dymowski and Myzgin 2021b, 205). Another *terminus post quem* is provided by two casual finds of cast copies of the same denarius with a portrait of Lucius Verus, and two antoniniani of Gordian III (?), from a settlement context of the Chernyakhiv culture at Borskiv in Vinnytsia region (Fig. 10.18), possibly yet another coin-casting workshop.

Nevertheless, I am inclined to date the start of the manufacture of *denarii flati* in Eastern Europe somewhat later — to third/fourth century, or the early years of the fourth century, when the Chernyakhiv culture enters a stage of stable development. This was a time of a potential shortage of the original Roman silver coins, and of conditions needed for the operation of counterfeiter workshops. Perhaps this is indirectly evidenced by production waste recovered in the Poltava region, and the defective coin found at Viytenki mentioned earlier. If these objects are the result of local production rather than being imports from the area of present-day western Ukraine, they could have been made not earlier than at the beginning of the fourth century, i.e. the time when the Chernyakhiv culture extended its range to this region. Alternatively, the coin-casting workshops could have been established at a different time, operated by 'itinerant craftworkers' (see discussion above).



Not to scale

Figure 10.18. *Denarius flatus* (a) and *antoninianus flatus* (b), probably found near Borskiv, Vinnytsia region (photo: Oleh Anokhin).

As for the decline of the manufacture of *denarii flati* on the territory of the Chernyakhiv culture, as yet we have no evidence whatsoever, not even circumstantial. It is possible that these coins continued in use until the middle of the fifth century.

For other parts of eastern Barbaricum, outside the range of the Chernyakhiv culture, we have no evidence of the manufacture of *denarii flati*, we can only date their influx and use in the region. I think the time frames are the same as for the territory of the Chernyakhiv culture. This is shown by *denarii flati* found in the area of the Wielbark and Przeworsk cultures, and also in southern

Scandinavia: as yet, we have no evidence whatsoever to confirm their local production, but neither do we have any evidence for the influx of these coins from any other region of the Barbaricum (e.g. the territory of the Chernyakhiv culture, or the area between the Rhine and Oder).

The situation in the non-Roman parts of modern Germany can be assessed differently. Mario Schlapke (see his text in this volume) believes that *denarii flati* from the settlement site at Frienstedt were made before the 250s. On the whole, given the archaeological character of the region this is quite feasible, no matter where the coins were made: on the site, in Thuringia, or in the Empire, where a counterfeiting epidemic was raging at that time. Our understanding of the chronology of manufacture of *denarii flati* in the non-Roman area of present-day Germany must certainly improve with the archaeological investigation and full publication of the production area at Raguth (Wigg-Wolf 2023).

Reasons for the Production

I think that the reason for coin copying in the Barbaricum was the same as for the outbreaks of counterfeiting epidemics within the Empire — a shortage of their originals. After all, despite the large number of single finds of official denarii, most of them have been recorded in hoards. For instance, on the territory of the Chernyakhiv culture the ratio of single finds of denarii and denarii found in hoards is approximately 1:8 (data for 2010: Myzgin 2010, 155). The production of copies (cast or plated) could really have been a reaction of the 'market' to the demand for coin. All the more because, unlike in the Empire, barbarian master coiners most likely were not constrained by laws which regulated the production of coins and severely penalized counterfeiting. Whether they operated openly, to supply private commissions, for instance, in bronze-casting workshops,[26] or preferred to keep a low profile — is much less clear. This issue is addressed somewhat later.

No less important is the question of the origin of these technologies. In 2022, Bartosz Awianowicz, Arkadiusz Dymowski, and Kyrylo Myzgin (2022, 139–41) suggested that they could have been passed to the Chernyakhiv culture people from the Roman provinces, similarly to many other provincial Roman innovations, e.g. technologies of soil cultivation, glassmaking, pottery, etc. It is to be remembered that some of the closest contacts of barbarians with Roman provinces date to the middle–second half of the third century (due to the Gothic Wars), namely the time when this region was afflicted by a counterfeiting epidemic. Thus it is reasonable to assume that it is from the provinces that the know-how needed to copy coins (by casting and by plating) was introduced to barbarian societies. Although the 'coin tree' technology of counterfeiting was used very rarely within the Empire, and was more characteristic of the Barbaricum, its use in the first half of the third century in Dacia (cf. the find of *denarii flati* from Apulum) suggests the latter was the source of this technology, carried to the Barbaricum.

How this happened is not fully clear so far: Was this just a transfer of ideas, was the production in the hands of captured/invited craftsmen, or simply, of counterfeiters from the provinces in search of livelihood (and possibly, also of shelter) on the territory of the Barbaricum? I think this could be true of Germany and Scotland, where there is evidence for the local production of *denarii flati*.

At the same time, I cannot completely rule out the possibility that the idea of copying coins was a local invention in the Barbaricum. As is known, bronze-casting and metalworking in barbarian societies of the late Roman period were generally fairly well developed, and the process of copying objects by casting was well known in the manufacture of e.g. jewellery and dress objects (e.g. for the Chernyakhiv culture: Magomedov 2001, 93–96).

Finally, we have to address the question of the possibility of the bringing of counterfeit coins to the Barbaricum from the territory of the Roman Empire. It is likely that some of these counterfeits could have passed to the barbarians, especially those close to epicentres of counterfeiting epidemics. Such as, e.g., Scotland or areas of Germany adjacent to the Roman limes. On the other hand, the large-scale importation of these coins to the eastern Barbaricum, and to areas in central and northern Barbaricum at a greater distance from the Roman frontier is much less likely. While it is very difficult, if not almost impossible, to distinguish between the fakes made in barbarian and provincial Roman counterfeiting workshops, the chronology of their prototypes is quite different. If in the Barbaricum most of the coins have their prototypes in first–second-century issues, in the Roman Empire these prototypes are from the late second century–first half of the third century. Hypothetically, *denarii flati* with late-dated prototypes found in the Barbaricum could be imports from the Empire. However, the materials from Ukraine suggest the local production of cast copies, in a small quantity, using impressions taken from Roman coins of the first half/middle of the third century (see earlier discussion).

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[26] It is unlikely that operation of barbarian counterfeiters in the open posed a threat to the economic security of the Roman Empire: by the time the workshops manufacturing *denarii flati* start operating within the Barbaricum, denarii in the Roman Empire had almost or fully fallen out of circulation.

Uses of denarii flati

The question of the use of *denarii flati* is much more complex. If only because it is still not entirely clear how Roman denarii were used within barbarian societies: Were they a means of accumulation? Did they serve as status symbols? Did they play an intermediary role in trade exchange, or were they a full-fledged medium of monetary circulation?

To determine the role of *denarii flati* it may be useful to analyse their context of discovery. First of all, in hoards. Among the metal-detector finds from Ukraine I succeeded in recording two assemblages their finders described as small hoards of cast denarii: one from an unidentified location, possibly in western Ukraine (seven coins), the other, from the Khmelnytsky region (thirteen coins) (Myzgin, forthcoming). However, this interpretation offered by the amateur metal detectorists must be treated with utmost caution, because rather than hoards these finds might represent the remains of still other counterfeiting workshops. *Denarii flati* are exceedingly rare in hoards of original denarii — at least in those assemblages where they could be identified. For instance, on the face of it, *denarii flati* were present in a hoard found at Khydnovychy, Lviv region (Bandrivskyi and others 2019, 234 fig. 3: 11), and in another, from Velika Severynivka in Kirovohrad region (unpublished), but we cannot be entirely certain without analysing the chemical composition of these coins, and this unfortunately is no longer possible. A more reliable find is a *denarius flatus* identified in a great hoard discovered in Poland, at Cichobórz, in the Lublin region (Bartecki and others 2023). One *denarius flatus* was found in a hoard from Birnie, in Scotland (Holmes 2006, 34). It seems that the quality of the coins that went into the deposits was carefully monitored: as a rule, it is not just *denarii flati* that are rarely seen in hoards, but fragments of coins too. Thus, the hoard data show that *denarii flati* were not subject to hoarding, or at least, not on a mass scale.

It is equally unclear whether *denarii flati* were deposited in burials. At least none of the publications of grave-sites or inventories investigated on the territory of the Barbaricum explicitly mentions the presence of cast copies of denarii (cf. Bemmann 2005). In the literature there are specific references to 'copper denarii' found in burials,[27] some of them even with a hole, but these could equally well be *denarii flati* and subaerati. In any case it is obvious that the practice of placing *denarii flati* in grave inventories, like furnishing burials with coins, was not widespread in the Barbaricum.

As for *denarii flati* discovered during archaeological fieldwork (i.e. recovered from stratified contexts), all of them are settlement finds (e.g. cf. Myzgin and Kodats'kyi 2021; Munteanu and others 2022; Mario Schlapke in this volume). Most of them are likely to be lost coins, which would imply their relatively common use in everyday life. How common, though? The average percentage ratio of *denarii flati* to official denarii found on the territory of modern Ukraine is approximately 1:13 (see above). On the one hand this suggests that the volume of *denarii flati* manufactured in the region compared to the number of official Roman coins was not that big. However, on the other hand we have to bear in mind that these statistics do not reflect regional differences of distribution where finds of *denarii flati* are seen to cluster in some regions, and are almost completely absent from others. For instance, if we compare any of the districts in the Khmelnytsky and Kharkiv regions, then in the former the density of finds of *denarii flati* is always much higher (cf. Filatova 2023). Nevertheless, the presence of *denarii flati* in settlement sites, often in the same context with original denarii, observed across the Barbaricum, does suggest that their use was similar everywhere. I am still wary about the existence of developed monetary circulation within barbarian society (cf. Myzgin 2019, 38–39). But even if we accepted the existence of some proto-form, then the *denarii flati* did not play any special, separate role in this circulation, and were treated on a par with original denarii, even though they were essentially fakes. Meaning, that they were manufactured primarily to deceive. As may be seen from the earlier discussion, in their appearance — colour and style — the *denarii flati* were very close to the originals (unlike e.g. the barbarian imitations). That care was taken, with rare exceptions, to separate the evidently failed specimens from good-quality coins is evidenced by the number of 'unfinished' specimens found on the site of presumed workshops, and the very limited number recorded outside them (cf. Nadvirnyak and Pohorilets 2019, 33–34).

Another important issue relates to the *denarii flati* made of high-grade silver. In some cases the silver of the denarii copies is even higher than the silver of the Roman prototypes (cf. Pohorilets and Nadvirnyak 2022, 24). Legally, in the Empire, where the state had a monopoly on coin production, these coins were high-quality counterfeits. However, when found in the Barbaricum, a counterfeit coin, higher in its intrinsic value than the original coin, can hardly be described strictly as a fake, since in this case the intention was not to deceive the recipient, but evidently to make a full-value silver coin. Obviously, the purpose of producing such expensive copies was to make up for the shortage of their silver prototypes. In this case, the cost of producing counterfeits was not important (out of the question on the territory Empire), but the main purpose was to replenish private or public stocks with coins that were not different from their originals. In other words, these were the same *monnaie de nécessité* of which Andrzej Kunisz (1987, 257–65) wrote in the context of the Roman Empire. In my view, such an investment in silver was made by those who had the raw material needed to manufacture such coins. It was on their orders that silver *denarii flati* might have been produced.

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[27] For instance, in Chernyakhiv culture cemeteries at Cherneliv-Ruskiy burial 44 (Gereta 2013, 35); at Danilova Balka, burial 15 (Kropotkin 2000, 27 no. 1799); at Budești, burial 57 (Vornic 2006, 85–86).

I will hazard a guess that manufacture of *denarii flati* within the Barbaricum was on two levels. One was initiated by the elites to make up for the lack of original coins with their high-grade silver copies (*denarii flati* AgG). In this case the cast copies were put in circulation deliberately and purposefully, without causing damage. The second level, on the other hand, involved private initiative prompted by the entrepreneurial spirit of individual counterfeiters and/or those who commissioned their goods (CuG and SnG).[28] While indeed the underlying cause was the shortage of official coin, the aim of the production was more likely, to deceive the recipient and directly benefit the parties involved. Obviously, this hypothesis is in need of careful testing.

Much less frequently *denarii flati* were used for ornamental purposes. While at this point I have no statistical data, not even approximate, about 'demonetized' *denarii flati*, according to my observations, their finds are not that frequent. If making a hole in a coin made of a rather brittle alloy could cause its deterioration (as in the case of the find from Husynne), this would explain the small number of finds of *denarii flati* with a hole. But there are exceptions: for instance, as Vital Sidarovich noted, in a group of *denarii flati* found in Belarus in the basin of the Neman, six out of nine cast copies of denarii were pierced (Sidorovich and Ermalitskaia 2021, 272–73).

At any rate, our understanding of the reasons behind the production of *denarii flati* and their uses within the Barbaricum can only improve with new material evidence, and first and foremost, continued study of the coining workshops.

Conclusions

Despite the differences in the progress of studies of *denarii flati* found on different sides of the limes, it is already possible to identify some commonalities and differences in their production.

The main difference between the production of *denarii flati* on the territory of the Empire and within the Barbaricum was the technology used: if on the territory of the Empire the predominant method was casting in single clay moulds, in barbarian territories the 'coin tree' method prevailed. On the other hand, the reason for the production was broadly the same: to make up for the shortage of original coins. Another difference is the conditions in which the counterfeits were produced. If on the territory of the Empire the practice was illegal and severely prosecuted, on the territory of the Barbaricum apparently it was not particularly covert, indeed, it even may have been regulated by the local elites (as was possibly the case for the production of *denarii flati* of high-grade silver). While in the Empire the activity of counterfeiters was to the detriment of the monetary circulation, in the Barbaricum its impact was more likely to have been positive, satisfying the demand for coins (possibly, the same as the production of *limesfalsa* in border towns). In any case, on both sides of the limes the activity of the majority of counterfeiters was evidently intended to deceive (obviously, except for the production of fakes from silver): the nature of the alloys, resulting in a colour resembling silver, and the relatively high-quality of this production, should have combined to make the owners of the *denarii flati* perceive them as original products of official mints. Since the production of cast copies of denarii was in actual fact a reaction of the market to the emerging demand, both within the Empire and the Barbaricum the forged coins were those urgently needed at the time. In the Empire they were denarii of the middle/second half of the second century, but mainly their Severan issues. On the other hand, in the Barbaricum the most commonly copied coins were Flavian and Nerva–Antonine denarii. At the same time, the chronology of production on different sides of the limes might be different. In the Roman Empire the production of *denarii flati* could have started as early as the second half of the second century, but did particularly well in the 230–260s, until it was displaced by *antoniniani flati*. In the Barbaricum this chronology could differ depending on the region: for instance, a somewhat earlier dating is feasible for the manufacture of the first *denarii flati* in the non-Roman region of today's Germany (first half of the third century), and a later one (second half of the third century, third/fourth century) — in the eastern Barbaricum and in present-day Scotland. In my view, the essential difference between these two phenomena is their geographical range. If on the territory of the Roman Empire *denarii flati* were apparently limited in their distribution to some regions only (mostly, the north-western provinces), rather than being widespread throughout, in the Barbaricum the evidence of barbarian counterfeiting activity is ubiquitous, although with some apparent foci (notably, the western reaches of the Chernyakhiv culture territory).

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[28] Attention should be paid to the variety of *denarii flati* prototypes. This indicates that possible customers had quite large stocks of original denarii, i.e. they could belong to the elite. On the other hand, such orders could also have been fulfilled collectively by individual communities.

It remains unclear whether the phenomena of the manufacture of *denarii flati* in the Empire and the Barbaricum were related in any way. As can be seen from the above discussion, it is possible that they overlapped chronologically to some extent; at the same time, the production know-how was probably introduced to the barbarians from the territory of the Roman provinces.

Another open question is whether the production of *denarii flati* in the Barbaricum was the result of a single great counterfeiting epidemic, or of a series of local epidemics. Or, was it a process extended in time and space? In other words, can we apply the term 'counterfeiting epidemic' to the situation in the Barbaricum? Especially given the chronology and nature of the circulation of Roman coins here. For the time being, resolution of this and several other issues is held back by the unevenness of scholarship on the phenomenon of *denarii flati* manufacture within the Roman Empire and the Barbaricum. However, I am sure that in the near future the publication of new materials, including those related to counterfeiters' workshops, will bring more clarity to these issues.

Translated by Anna Kinecka

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BARTOSZ AWIANOWICZ

11. Cast Counterfeit Coins or *pecunia flata*? Ancient Latin Sources and the Term *denarii flati*

ABSTRACT The purpose of this paper is to discuss ancient literary sources and Roman coin legends that justify the use of the term *denarii* (or *antoniniani*) *flati* in place of Anglo-Latin terms like counterfeit or imitative cast denarii (or antoniniani). The verb *flo*, *flare*, *flavi*, *flatum*, including the participle *flatus*, *-a*, *-um*, appears in a numismatic context in several Latin texts, the most important of which seems to be a passage in *Noctes Atticae* by Aulus Gellius (*c.* 125–*c.* 180), who writes about early 'cast (or minted) and stamped coinage' (II. 10. 3: 'flata signataque pecunia'). The term has the advantage of being not only rooted in ancient Roman sources, but also that it can be referred both to various categories of undervaluated, semi-official and unofficial coins produced in the Roman Empire, as well to the coins found in the Barbaricum area.

KEYWORDS numismatic terminology, *denarii flati*, denarii, antoniniani, counterfeits, Latin literary sources, Latin abbreviations

Most terms that modern numismatists use to describe various types of Roman coin are from Latin. Many of them, for instance *bigati*, *quadrigati*, and *victoriati* are noted in the famous numismatic passage in Pliny's *Naturalis historia* (XXXIII. 46), others appeared for the first time in historical works, like *serrati* in Tacitus's *Germania* (V. 3) and *Antoniniani* in *Historia Augusta*, even if it refers in the source only once to double denarii — *argentei Antoniniani* (*SHA*, *quadrigae tyrannorum*, XV. 8) and three times to gold binios (*Divus Aurelianus*, IX. 7 and XII. 1; Probus, IV. 5), or in poetry, like the adjective *subaeratus* in Persius's *Satire* 5 where we can read about 'a copper' that 'sounds falsely underneath the gold' (V. 105–06: 'subaerato mendosum tinniat auro'). Yet we still use the descriptive forms of vernacular languages to denote cast counterfeit denarii (and less common antoniniani), while there is a term *flatus* — the past participle of the verb *flo*, *flare*, *flavi*, *flatum* that can be exactly fitting for the phenomenon.

The participle is well attested in Roman literary sources concerning coin production in the pre-denarius period. M. Terentius Varro (116–27 BC) mentions 'the oldest copper / bronze coinage' that was 'stamped with cattle'[1] (*R.R.*, II. 1. 9: 'quod aes antiquissimum quod est flatum pecore est notatum'). Aulus Gellius (*c.* 125–*c.* 180) writes about early 'cast (or minted) and stamped coinage' (II. 10. 3: 'flata signataque pecunia') in the context of Varro's answer to lawyer Servius Sulpicius's question about the term *favisae Capitolinae* (II. 10. 3–4):

> Ac deinde eadem epistula [Varro] negat quidem se in litteris invenisse cur 'favissae' dictae sint, sed Q. Valerium Soranum solitum dicere ait, quos

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[1] All translations from Latin (except for Gellius's passage) by the author.

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Counterfeits, Imitations, and Copies of Roman Imperial Denarii: Making and Faking Coins on Both Sides of the Limes, ed. by Arkadiusz Dymowski and Kyrylo Myzgin, WSA, 8 (Turnhout, 2024), pp. 217–220. This is an open access chapter made available under a CC BY-NC 4.0 International Licence.

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> ‘thesauros’ Graeco nomine appellaremus, priscos Latinos ‘favisas’ dixisse, quod in eos non rude aes argentumque, sed flata signataque pecunia conderetur. Coniectare igitur se detractam esse ex eo verbo secundam litteram et ‘favisas’ esse dictas cellas quasdem et specus, quibus aeditui Capitolii uterentur ad custodiendas res veteres religiosas.
>
> > (And then Varro goes on to say in the same letter, that he had never found any explanation of the term *favisae* in literature, but that Quintus Valerius Soranus used to assert that what we called by their Greek name *thesauri* (treasuries) the early Latins termed *flavisae*, their reason being that there was deposited in them, not uncoined copper and silver, but stamped and minted money. His theory therefore was, he said, that the second letter had dropped out of the word *flavisae*, and that certain chambers and pits, which the attendants of the Capitol used for the preservation of old and sacred objects, were called *favisae*.) (Trans. Rolfe 1984, 153)

This etymology is not confirmed by modern linguists (see Rolfe 1984, 152–53, n. 1 and Cassatella 2005, 78 and 83 n. 12), which does not change the fact that for Roman antiquarians, such as Valerius Soranus at the beginning of the first century BC and Varro himself in its second half, the archaic term was probably associated with the method of coin production during the early Republic.

However, in the first century BC the verb *flare* no longer meant ‘to cast’, but more generally: ‘to mint’ or even ‘to strike’. Therefore Cicero asks in a series of rhetorical questions in his speech *Pro P. Sestio* rather about ‘the authority over coin minting’, not ‘casting’ (66: ‘quae ratio aut flandae aut conflandae pecuniae non reperiebatur?’) and we can find such coin legends as LENT(ulus) CVR(ator) 𐆖 [i.e. denariorum] FL(andorum) on the reverse of denarii issued in 76–75 BC in Spain (?) by Cn. Lentulus (RRC 393/1b; Fig. 11.1: a), and III VIR PRI(mus) FL(avit) on denarii issued in 43 BC in Rome by L. Flaminius Chilo (RRC 485/2; Fig. 11.1: b), that have been struck. An interesting abbreviation of the official title of mint officials (*quattuorviri*) also appears on aurei dated to 42 BC (RRC 494/1–9). The names of *quattuorviri monetales*: L. Livineius Regulus, P. Clodius, and L. Mussidius Longus are accompanied here by the legend IIII VIR·A·P·F, which should be read as *quattuorvir auro publico flando*[2] (‘a member of the board of four for the minting of public gold’) (see for instance types RRC 494/1; Fig. 11.1: c, and RPC 494/9a; Fig. 11.1: d). Such an interpretation of the verb *flare* is connected here with the linguistic tradition of the first century BC, but technical texts from the same period show that *flare* and *conflare* still signified the casting process, as confirmed by Vitruvius when he writes about the production of lead pipes (VIII. 6. 11: ‘fundendo plumbum flatur’; cf. ThLL VI.1, 914).

Another written source in which the verb *flo*, *flare* probably appeared in reference to counterfeit coins is the *Lex Cornelia testamentaria nummaria* or *Lex Cornelia de falsis* that was enacted by Sulla *c.* 81 BC (for the chronology see Hasler 1980, 98–99). The original text of the law is lost, but Ulpian’s (*c.* 170–223 or 228) testimony, important for our terminological considerations, has survived. This famous jurist of the Severan period quoted the passage from the Cornelian law in his *De officio proconsulis VIII* as follows: ‘Lege Cornelia cavetur ut qui in aurum vitii quid addiderit, qui argenteos nummos adulterinos flaverit, falsi crimine teneri.’ (*Dig.*, XLVIII. 10. 9: ‘The Cornelian Law states that those who introduce some flaws into gold, or those who cast fake silver coins, are held guilty of the crime of counterfeiting’). The first part of the above sentence is an addition from the Imperial period, since aurei were not issued regularly during the Republic, and, as Philip Grierson (1956, 242) observes, gold is mentioned in this law in the context of controlling the quality of metal used by moneyers (see also Găzdac 2009, 1488 and Heinrichs 2008, 247–48). Moreover, we have here a clear distinction of techniques: the forger merely adds (‘addiderit’) ‘some base metal or alloy’ (‘vitii quid’) to gold coins, while counterfeit silver coins are ‘cast’ (‘flaverit’). The verb *flo*, *flare* here may still date back to the original *Lex Cornelia* from the early first century BC and mean generally: ‘to mint’ or even ‘to strike’, but there is also no strong argument against the hypothesis that the entire passage is a paraphrase made by Ulpian living in the late second and early third centuries AD and refers to the practice of casting counterfeit denarii, which was becoming increasingly common in that period, while cast aurei remained a phenomenon known almost exclusively from the Barbaricum area, as Kyrylo Myzgin writes in this volume.

The term *denarii* (and *antoniniani*) *flati*, although its participle form (*flatus*, *-a*, *-um*) appears in Roman written sources with the indisputable meaning of ‘cast coins’ only in Aulus Gellius’s *Noctes Atticae* (II. 10. 3), seems to be much better rooted in the Latin linguistic tradition than English-Latin clusters like 'cast denarii', especially since other forms of this verb are well attested in the monetary context from the first century BC to the third century AD. This seems to be sufficient grounds for the term to come into common use in the numismatic literature, where terms like *subaeratus* or *binio* based on single sources, have been around for centuries. Moreover, the participle *flatus* (in sing., or *flati* in plur.) seems to be much more practical because it does not indicate whether we are dealing with counterfeit coins or with official (or rather semi-official) issues of local Roman mints, the production of which was widespread, as Markus Peter (2004, 23–25) points out, especially in *c.* 235–260. Therefore, the term *denarii* (or *antoniniani*) *flati* can aptly refer both to various categories of undervaluated, semi-official, and unofficial coins produced in the Roman Empire, as well to the coins found in the Barbaricum area, where the finds contain both cast coins from the Roman Empire as well as local cast imitations.

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[2] The interpretation that ‘F’ should be considered an abbreviation for *flando*, not *feriundo*, is based on an analogy with the legend on denarius of 43 BC (RRC 485/2), and on the fact that the two ‘F’ as abbreviations for *flando* and *feriundo* (in the title *triumvir auro argento aere flando feriundo* — ‘a member of the board of three for the casting and striking of gold, silver, and bronze’) do not appear in the titulature of monetary officials until Augustus, from *c.* 19 BC (see Sutherland 1984 (RIC I), 65–77).

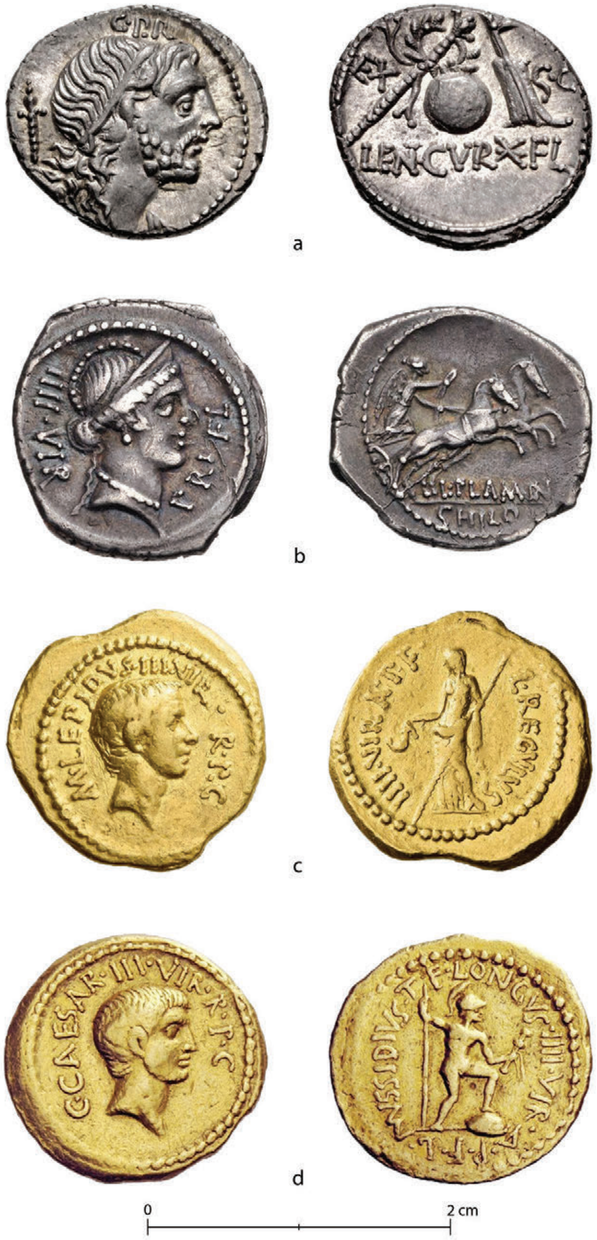

Figure 11.1. a — Cn. Lentulus, AR Denarius (3.98 g), Spanish(?) mint, 76–75 BC. Obv. Diademed and draped bust of Genius Populi Romani right, with sceptre over shoulder, above, G·P·R·. Rev. Sceptre with wreath, globe, and rudder, on left EX, on right, S·C, below LENT·CVR X FL. Sydenham 752a; RRC 393/1b (Classical Numismatic Group, Inc., Electronic Auction 468, 277).

b — L. Flaminius Chilo, AR Denarius (4.09 g), Rome, 43 BC. Diademed head of Venus right, III·VIR behind, PRI·FL before / Victory in biga right, holding wreath and reins; FLAMIN below, CHILO in exergue. Sydenham 1088; RRC 485/2 (Classical Numismatic Group, Inc., Electronic Auction 294, 520).

c — M. Aemilius Lepidus with L. Livineius Regulus, Aureus (8.03 g), Rome, *c.* 42 BC. Obv. M·LEPIDVS·III·VIR·R·P·C, bare head of Lepidus right. Rev. L·REGVLVS – IIII VIR·A·P·F, the Vestal Aemilia standing left, holding simpulum and sceptre. Sydenham 1105; RRC 494/1 (Numismatica Ars Classica NAC AG, Auction 125, 461).

d — Octavianus with L. Mussidius T. F. Longus, Aureus (8.07 g), Rome, *c.* 42 BC. Obv. C·CAESAR·III·VIR·R·P·C, bare head of Octavian right. Rev. L·MVSSIDIVS·T·F·LONGVS·IIII·VIR·A·P·F·, Mars, wearing Corinthian helmet, standing right, holding sword in left hand and spear in right and resting left foot on shield. Sydenham 1098; RRC 494/9a (Numismatica Ars Classica NAC AG, Auction 92, 4).

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